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Natural resource rents, autocracy and economic freedom

Morten Endrikat

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Abstract

This paper theoretically and empirically investigates the effect of natural resource rents on the process of economic liberalization and a potential moderating effect of the level of democracy. A simple political-economic model is developed in which the government in an autocratic country faces a trade-off between liberalizing the economy to broaden the tax base on the one hand and consolidating its political power by preventing the rise of an economically independent middle class striving for political participation on the other hand. Whilst the theoretical model predicts that rents from natural resources lead to economic liberalization in both autocratic and democratic countries, the empirical analysis finds evidence that increasing resource abundance may lead to deliberalization in autocracies but may promote liberalization in democracies. The empirical evidence is robust to using both static panel data methods that control for unobserved country heterogeneity as well as a dynamic GMM estimator that further controls for potential endogeneity issues.

JEL classification: D73, H20, O13, O39, Q32, Q38

Keywords: Natural Resources, Resource Curse, Institutions, Taxation, Economic Liberalization, Entrepreneurship

1 Introduction

Since the early exogenous growth models in economics, technological development is known to be a driving force of economic growth (Solow, 1956). Explaining cross-country differences in economic development is still a major question in economics and over the last decades, numerous different influencing factors have been investigated in detail. Among others, two popular questions that are discussed among scholars are that of the ways institutional quality and abundance in natural resources, such as hydrocarbons or minerals, influence economic development.[1] These two aspects have been combined in the huge amount of literature on the so called resource curse and rent-seeking activities have been identified as one main channel through which rents from natural resources can lead to economic downturns especially in countries with bad institutions. It is argued that the rents increase the incentives for rent-seeking and therefore lower the level of productive entrepreneurship in the presence of bad institutions.

In this paper, I focus on the business environment designed by the government and the way it is changed in reaction to external factors, which can be thought of as one part of the process of economic liberalization. I argue that the business environment may change due to a resource boom and that this depends on the quality of a country's overall institutions, approximated by the level of democracy. In particular, I assume that it is not only the amount of available rents that influences an agent's decision to engage in rent-seeking instead of productive entrepreneurship, but also the incentives for potential entrepreneurs set by the government. With the identification of this channel, this paper contributes to the existing literature on natural resources, institutions, and entrepreneurship by providing an explanation why natural resource abundance may have a negative effect on entrepreneurial activity in some countries. Moreover, instead of talking about bad institutions in general, which is often equated to an autocratic regime, I distinguish between autocracy in general and particular institutions that influence the productive capacity of a country in form of entrepreneurship. In detail, I focus on the level of economic freedom and on the process of economic liberalization and argue that this is not per se lower in autocratic countries and that windfall rents from natural resources play an important role in this context. Although autocratic structures are often associated with weak economic performance, throughout history there have been numerous examples of countries, especially in East Asia, that have experienced rapid economic development under regimes with strong political power and that nowadays exhibit high levels of economic freedom (Acemoglu, 2005, 2008).

There are many reasons why economic freedom leading to the foundation of new firms can

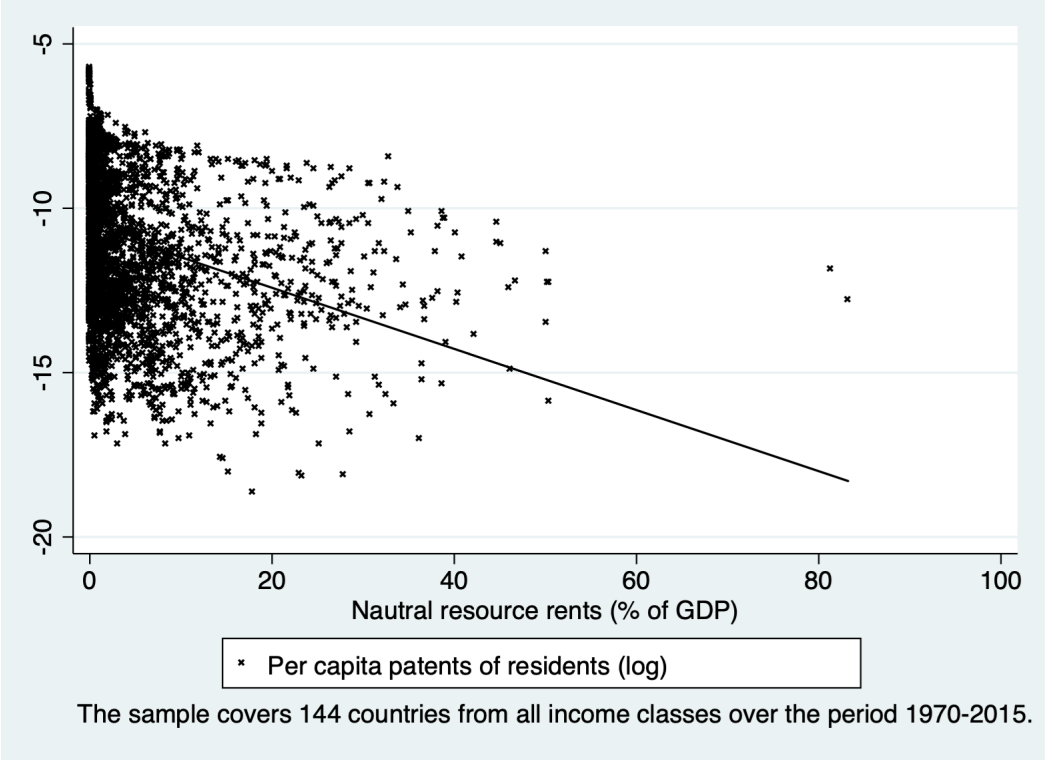
[1] See, among others, Acemoglu et al. (2019) for recent evidence on a causal link between institutions and economic growth and Havranek et al. (2016) for a meta-analysis of a potential natural resource curse.

foster economic growth. New firms may create knowledge spillover effects that have the potential to boost the economy (Romer, 1990) and may promote innovations, both on their own and by threatening incumbent firms, which then generates technological change leading to economic growth beyond the current steady state (Solow, 1956). Moreover, entrepreneurship may lead to a higher degree of an economy's diversification and therefore make it less vulnerable to industry specific shocks and hence to economic downturns. A high level of economic diversification is especially important for countries abundant in natural resources to mitigate potential negative Dutch Disease effects and to make them less vulnerable to highly volatile international resource prices. Besides the direct effects on economic performance, low levels of economic freedom may create incentives for potential entrepreneurs to emigrate and start their business in other countries, which then may cause well known aspects of brain drain and idea drain. Emigration of workers with different skill levels may also influence the institutional development of a country and impede political modernization (Docquier et al., 2016).

Summing up, there is a lot of evidence in the literature that entrepreneurship has positive effects on economic development and hence it is important to identify channels that influence the incentives to engage in entrepreneurship. This paper focuses on the effects of rents from natural resources on the business environment and on how this is moderated by the level of democracy. Farzanegan (2014) empirically finds a statistically significant negative effect of oil dependency on entrepreneurial activity, which raises the question about the particular channels of this effect. Figure (1) underlines this observation by depicting a clear negative correlation between the share of rents from natural resources[2] in total GDP and the patent activity measured by registered patents by residents (logarithmized) as in indicator for innovative capacity. One explanation for this observation may be that rents from natural resources raise the incentives for economic agents to engage in rent-seeking rather than investing in entrepreneurship and innovation, hence lowering the innovative capacity (Torvik, 2002). Nevertheless, even in the presence of large windfall rents, the government can foster entrepreneurship and innovativeness by creating a business-friendly environment to stimulate productive activities and impede rent-seeking. Hence, to draw a clearer picture of the potential mechanisms, this paper theoretically and empirically investigates the effect of natural resource rents on the business environment created by the government and focuses on potential differences between democratic and autocratic countries.

[2]Unless stated explicitly, natural resources refer to oil, gas, minerals, coal, and wood.

Figure 1: Natural resource rents and patent activity



2 Related Literature and Theory

The main literature this paper is based on is the vast literature about the conditional resource course, a term that describes both theoretical and empirical evidence that natural resource abundance and/or dependence is, on average, only harmful for countries with bad institutions, a theory that partially tackles the very early findings of Sachs and Warner (1995) about a general resource curse. Mehlum et al. (2006) implement natural resource abundance and institutional quality into a rent-seeking model and show that natural resource abundance in the presence of low quality institutions is bad for the economic development of a country. They empirically test their findings by adding an interaction term of resource abundance and institutional quality to the classical growth regressions of Sachs and Warner with resource abundance and find evidence that supports the predictions of their theoretical model of a negative interaction effect on economic development. Although they use GDP growth rates as their dependent variable, the main prediction of their model goes beyond the simple relationship of resource abundance, institutional quality, and economic growth. In their model, economic performance depends on the share of labor that is dedicated to rent-seeking relative to the share used for productive activities which they generalize as entrepreneurship. They argue that the attractiveness of rent-seeking relative to productive entrepreneurship inversely depends on institutional quality, which seems plausible but ignores the fact that also the regime itself may have an incentive to encourage or impede entrepreneurship. The trade-off that the government may

face is the following: On the one hand, more entrepreneurship may lead to a higher tax base and therefore to higher tax income for the government, but on the other hand may foster the emergence of an economically independent and politically active middle class, which may lead to more political pressure on the regime and democratization tendencies, a mechanism that threatens regimes in autocratic countries, which try to maintain their political power. Arguments similar to this are widely used in the political-economic literature that tries to explain the reasons for inefficient institutions and different types of institutions in general (Acemoglu, 2006, 2008). Economic development has the power to reduce economic inequality, which may lead to a large and economically independent middle class that strives for political participation to enforce policies to redistribute economic and political power. Different to the government in a democratic country, an autocrat may therefore have the incentive to impede entrepreneurship to maintain the status quo of strong economic and political polarization, which becomes easier in the presence of alternative income sources besides taxation, e.g. windfall rents from natural resources.[3] Besides protecting the groups that hold political power from rising political competitors, impeding entrepreneurship or more generally speaking impeding market entry also serves as a classical channel of economic rent-seeking. In many cases, the politically powerful groups control major parts of the economy via monopoly structures, which enable them to skim off monopoly rents. Protecting these monopoly positions by creating high entry barriers for potential competitors is in the interest of the groups in power but leads to inefficient overall economic outcomes. The divergence between the aims of a social planner and the powerful groups in a society are commonly known as "social conflict" (Acemoglu, 2006, 2008). According to Acemoglu (2006) it depends on the reason for the inefficiencies, i.e. the main incentive of the ruling elite of a country, whether the elite wants to promote or impede the productivity of the middle class. He argues that in the case that the elite mainly focuses on revenue extraction from the middle class, they may encourage investments made by the middle class, whereas if their main interest is political consolidation, they may aim to prevent the middle class from prospering, which may additionally lead to an underinvestment in public goods that would serve as a complement to the middle class' investments. Based on these assumptions, it does not seem straightforward whether autocratic regimes implement policies that encourage or discourage entrepreneurship, since it is not straightforward what the main incentive of the elite is. Aghion et al. (2007) find empirical evidence that more democratic countries, on average, tend to have lower entry barriers and entry costs but there are also some prominent examples of rather autocratic countries that have significantly liberalized their economies, such as Chile in the 1970s and 1980s or China over the last two decades. Given these arguments, it seems

[3]See for example Easterly (2001) for the link between the size of the middle class and political and economic development.

likely that the presence of substantial rents from natural resources shifts the focus of the elite to maintaining the power as the rents relax the elite's need to extract rents from the middle class and thus reduce the opportunity costs of keeping the middle class poor. Acemoglu (2006) also implements rents from natural resources that serve as an additional income besides taxes for the group in power - in the initial situation the ruling elite - into his model and shows that when these rents increase, the elite focuses more on stabilizing its political power preventing a middle class from emerging even although this happens at the expense of lower tax income for the elite. In this paper, I build on the mentioned findings and argue that windfall rents from natural resources shift the incentives of the elite away from extracting revenues from the middle class to political consolidation simply because the rents serve as an alternative income source for the elite. Concluding, natural resource rents may lead to lower levels of economic freedom in autocratic countries. This argument is in line with Endrikat (2017), where I show empirically that in autocratic countries natural resource rents lead to low investments in public education by the government. A good educational system not only enables large parts of the society to become economically independent, but well educated citizens may also strive for more political participation. Different to Acemoglu (2006), this paper explicitly takes into account that the probability of the political leading group for being replaced is not only determined by the income of other groups seeking for political power but also by the overall economic performance of the country.

In general, there is a vast literature that tries to explain parts of the resource curse hypothesis with rent-seeking models in which rent-seeking becomes more attractive when rents from natural resources increase. The main mechanism that these models have in common is that rent-seeking crowds out relatively more productive economic activities that are often also referred to as entrepreneurship (Baland and Francois, 2000; Torvik, 2002). In the model of Baland and Francois (2000), the effect of an increase in the economy's natural resources on the level of rent-seeking depends on the initial level of rent-seeking. If the initial level is high, a resource boom further increases it, whereas if the initial level is low, meaning the level of entrepreneurship is high, the opposite is the case. This can also be interpreted as that the initial quality of institutions matters for the effect if one assumes that the level of rent-seeking depends on institutional quality as it is often the case in the literature.

Farzanegan (2014) empirically investigates the effect of natural resources on a country's level of entrepreneurship. Conducting a panel data analysis for a sample of 65 countries over the period 2004 until 2011, he shows that high dependency on oil rents has a negative and statistically significant effect on the entry density of new firms in the formal economy. Moreover, his results give hint to a moderating effect of high government effectiveness that attenuates the

negative effect of oil dependency on the level of entrepreneurship, whereas he does not find a negative effect of any other type of natural resources. These results are in line with Torvik (2002) and Mehlum et al. (2006), but mainly focus on outcome variables, namely the density of new firms entry. In this paper, I focus on the quality of the business environment as an external explanatory factor of less entrepreneurial activity besides the internal motivation of potential entrepreneurs.

Majbouri (2016) empirically tests whether profits from oil and gas foster rent-seeking activities at the expense of entrepreneurial activity. In his study, he uses survey data from the *Global Entrepreneurship Monitor (GEM)* from 2004 until 2008 to measure individual economic activity in the sense if the respondents engage in their own business. In particular, he creates a variable that measures the share of the adult population engaging in entrepreneurship or currently trying to start a new business and regresses this on per capita oil and gas rents and several control variables, among others a corruption index and its interaction with the rents variable. His study covers a sample of 50 oil and gas producing countries and the results suggest that high per capita rents from oil and gas impede entrepreneurship in high and medium corrupt countries, whereas in environments with little corruption they have the power to foster it. Majbouri argues that large windfall rents in a corrupt environment increase the incentives for the citizens to engage in rent-seeking and that this channel leads to less entrepreneurial activity. Although this explanation seems straightforward and is in line with much of the literature in this field, it ignores the fact that the decision to start an own business not only depends on personal motivation and the outside options but also on the bureaucratic entry barriers, a parameter that varies both across countries and over time. Moreover, a person that is not active as an entrepreneur, does not necessarily need to be a rent-seeker, an aspect that is also not considered in the paper.

In this paper, I add to Majbouri (2016) and try to identify a particular channel through which natural resource rents reduce entrepreneurship by focusing on the degree of economic freedom, which is directly controlled by the government. I argue that the government influences the degree of entrepreneurial activity by designing the legal regulations for setting up a business and that the motivation to foster or impede entrepreneurship can differ between democratic and autocratic regimes. This poses the question why a government may have an interest in impeding innovations and new businesses and hence economic development by increasing the burdens for economic activities of the private sector. One potential reason may be that especially regimes that are not democratically legitimized want to prevent an economically independent middle class to arise as people may strive for democratization once they have reached a certain level of prosperity. In the political economy literature, there is no clear consensus on whether citizens

of the middle class seek for political participation and hence for democratization and if they do so, under which conditions this is the case. Nevertheless, for a long time, scholars have been arguing in favor of a modernization effect, i.e. a causal relationship between overall economic prosperity and democratization and have presented evidence from past experiences of countries that have undergone the process of democratization. Lipset (1959), in a very early paper, states that general economic wealth - among other conditions - may promote democracy, but adds that there is no single condition that leads to democratization per se. Although economic wealth in general is not necessarily linked to a broad and strong middle class, the middle class is assumed to play a particular role as they are better educated as the working class which gives them the capacity to participate in the political process. Moreover, once people achieve a moderate level of prosperity, they may strive for a democratic society to be better protected against expropriation by the ruling elite. The more economically independent the middle class gets, the stronger may be their request for political participation as their basic needs are satisfied and they achieve a higher degree of leisure time compared to the working class. Even if it is difficult to clearly define different classes within a society and to assign people to these classes, it seems reasonable to assume that once people move up to a certain level of economic prosperity without being dependent on the regime, they begin to care about political participation.[4] The general argument that economic wealth of a country promotes or consolidates democracy has been convincingly disputed by Acemoglu et al. (2009), who empirically show that most of the previous results in the literature in favor of such a causal link have suffered from omitted variables and that most of the cross-country differences are driven by historical country-fixed effects. This argues against the general modernization hypothesis and in favor of the critical juncture hypothesis which states that particular country specific historic events pave the way to democracy or autocracy. Nevertheless, even if the general modernization hypothesis does not seem to withstand modern empirical approaches, it still seems reasonable to assume that aspects of economic development other than the overall average income level do influence political development. The average income level simply may not be an adequate measure of economic development, as there are many societies with a relatively high level of average prosperity but with a very uneven wealth distribution, i.e. with a small elite holding most of the wealth, an aspect that becomes especially important in countries with large windfall rents. Given this, it seems plausible to not only focus on the average income level as a determinant for democratization but also on aspects like the income distribution and the existence of several political and economic classes in a society.

In addition to the rent-seeking literature, there is another strand of the literature that focuses

[4]See Chen and Lu (2011) for a detailed review of the literature about the role of the middle class in democratization processes.

on cross-country differences in entry regulations for start-up firms and links these differences to differences in institutional quality. Djankov et al. (2002) have collected a very detailed dataset about many different aspects of business regulations for 85 countries of all income classes. They derive three main variables from the data, namely the number of procedures, official time, and the official costs a start-up must bear to enter the market. By linking this information to cross-country differences in economic development, the authors reveal a negative correlation between GDP per capita and the degree of business regulation, which is in line both with public choice and public interest theories. In addition to economic development, the authors also link the degree of regulation to the level of compliance with international quality standards and find a negative effect of regulation on public outcome variables such as the level of environmental pollution. Moreover, they also find a positive correlation between the degree of regulation and the level of corruption and other measures of good governance even after controlling for the level of income. In general, their results suggest that regulation primarily leads to greater opportunities to create rents (tollbooth theory) instead of higher product standards, which supports the public choice theory and rather speaks against the predictions of the public interest theory.

The literature that this paper has the closest link to is a book of Nimah Mazaheri published in 2016. Mazaheri empirically investigates the influence of oil wealth on, besides other variables, the business environment and on the level of entrepreneurship as an outcome variable. He defines entrepreneurs as being mainly members of the non-elite that are endowed with a rather small amount of capital and that therefore predominantly found small and medium-sized enterprises. In his analysis, he uses three different measures of oil wealth, namely oil income per capita and two dummies for oil producing and long-term oil producing countries. Moreover, he creates a variable that measures start-up regulation by multiplying the number of procedures required to build a start-up with the length of the procedures. Using data for Non-OECD countries from 2004-2010, he finds an overall positive and statistically significant effect of oil wealth on the level of start-up regulation that holds after controlling for a broad set of other variables. Moreover, he finds similar effects on tax regulation and contract regulation and additionally on outcome variables such as the entry rate of new firms and the number of applied patents (Mazaheri, 2016). The main shortcoming of his results is the fact that Mazaheri uses regressions that do not control for unobserved country-specific facts wherefore they mainly capture between-country differences. He controls for several variables, such as a measure of autocracy and population size and argues that there is relatively little within-country variation in the data on business regulation. Notwithstanding, that can not ensure that the results are not partly driven by unobserved country heterogeneity. In addition to this, his sample leaves

out OECD countries such as Norway, Canada and Mexico that are rich in natural resources and nevertheless partly have experienced processes of economic liberalization, which may cause a selection bias in his analysis. It is not clear why medium and high-income countries per se should be excluded from studies on phenomena that are mainly prevalent in less developed countries, as countries with a higher level of economic development may serve as a good control group. Mexico for example, whose oil rents on average made up to nearly five percent of its GDP between 1975 and 2015, has improved its business environment according to the Fraser Regulation indicator from 4.7 (out of 10) in 1975 to 7.1 in 2015 and Norway, whose rents (mainly from oil and gas) were even higher over the same period with 6.7 percent of GDP on average, has improved from a medium level of 6.0 in 1975 to 7.7 in 2015 (Gwartney et al., 2018). Canada, according to the *Ease of Doing Business Project* of the World Bank, even belongs to the group of countries with the lowest number of regulatory procedures necessary to open up a new business, a fact that is also highlighted by Mazaheri (The World Bank, 2019). Leaving out these countries can lead to a substantial upward bias in the negative effect of oil wealth on the business environment especially in regressions that focus on cross-country differences. Moreover, Mazaheri controls for the level of autocracy, but does not control for a potential interaction between oil wealth and regime type. In the empirical part of this paper, I complement the work of Mazaheri by covering a broader set of countries including OECD countries over a longer time period, adding rents from other natural resources besides oil, and testing for a potential interaction effect between regime type and resource rents. The well-known case of Norway but also other resource rich countries, for example Trinidad and Tobago with substantial oil rents of nearly six percent of total GDP in 2014, with relatively high levels of economic freedom show that rents from natural resources do not impair the business environment per se. Additionally to the aforementioned aspects, I account for unobserved country heterogeneity and potential endogeneity in the empirical part of this paper.

3 A simple model of taxation, entry barriers and political support

I partially build on the model by Dadasov et al. (2013) in which a ruling elite E earns income from expropriating the general population, whose size is normalized to one and that can chose between working in a traditional sector T or becoming an entrepreneur and operating in a more productive modern sector M. Different to their approach, I focus more generally on a regime in power, which can be the elected government in a democratic society or the ruling elite in an autocracy. I abstract from potential expropriation as considered in the aforementioned paper

and consider a simple rate of taxation τ on economic activities in both sectors of the economy, the traditional and the modern sector, which corresponds to a proportional tax system. I allow for negative tax rates in the model to account for the fact that, in the presence of additional external government revenues, the regime may distribute parts of these rents to the citizens to increase its popularity and to consolidate its power. To keep the model as simple as possible, I refrain from adding a separate variable that captures potential redistribution in form of public goods or direct payments and simply focus on the net transfers between the population and the regime. The regime does not engage in any kind of productive activity and only generates its income from taxing the normal citizens and from natural resource rents R, which are generated without any labor input of the domestic society. One can think of the regime earning these revenues from selling mining licenses to international companies that then exploit the natural resource reserves using their labor and capital. As in Dadasov et al. (2013), production in the traditional sector is depicted by a decreasing returns to scale technology with

$$Q_T = L^{\beta}, \tag{1}$$

where L is the number of workers and $0 < \beta < 1$. Different to their model, I only consider the static case and therefore abstract from any time index. Assuming that each worker supplies one unit of labor and that profits are equal to zero in the traditional sector, each worker's net income in the traditional sector is given by

$$y_T = (1 - \tau)\frac{L^{\beta}}{L}. \tag{2}$$

Production in the modern sector reveals constant returns to scale and is depicted by

$$Q_M = \alpha H, \tag{3}$$

where $H = 1 - L$ is the number of entrepreneurs and $\alpha > 1$. The country's overall non-resource income is then given as

$$Q = Q_T + Q_M. \tag{4}$$

Citizens that become entrepreneurs face bureaucratic entry barriers to open up their business. I model these entry barriers in the form of iceberg costs, such that the income of each entrepreneur is equal to

$$y_M = (1 - \gamma)(1 - \tau)\alpha. \tag{5}$$

Different to the taxes, the entry costs γ do not transfer to the regime and simply depict

a deadweight loss. Entry barriers may either stem from unintentional inefficiencies in the bureaucratic system, as it is often the case in less developed countries, or they may be created by the regime to control and limit the entry of new entrepreneurs in the modern sector as a way to consolidate the political power of the elite as in Acemoglu (2008). For the purpose of this paper, I assume that the level of entry barriers is the result of the regime's decision and not the result of unintended inefficiencies, hence lowering the entry barriers can be seen as an approach to economic liberalization.[5] In equilibrium, citizens need to be indifferent between becoming an entrepreneur and working in the traditional sector and hence it follows from equation (2) and equation (5) that

$$\begin{aligned} y_T &= y_M \\ \Leftrightarrow (1-\tau)\frac{L^\beta}{L} &= (1-\gamma)(1-\tau)\alpha \\ \Leftrightarrow L^* &= [\alpha(1-\gamma)]^{\frac{1}{\beta-1}}. \end{aligned} \tag{6}$$

To obtain an interior solution with $L^* < 1$, it is sufficient to assume that $\gamma < 1 - \frac{1}{\alpha}$. From equation (6) it becomes immediately clear that the number of citizens engaged in entrepreneurship decreases in the degree of entry barriers γ but is independent from the general tax rate τ since both economic activities are taxed with the same rate.
Given the system of taxation, the income of the elite can be written as

$$Q_E = \tau(H\alpha(1-\gamma) + L^\beta) + R.$$

The variable R depicts rents from natural resources that serve as an additional source of income for the regime and whose generation does not require any domestic labor as stated above. With $L^{\beta-1} = \alpha(1-\gamma)$ from the equilibrium condition of equation (6), the equilibrium income of the regime can be simplified to

$$Q_E = \tau\alpha(1-\gamma) + R. \tag{7}$$

The regime faces a certain probability of being deprived of power, no matter whether the regime is the elected government in a democratic country or an autocratic elite ruling a non-democratic country. I assume that, if the regime is removed from power and replaced by another leading group, the members of the former elite fall back to an exogenous income level which is

[5]The parameter γ is of similar interpretation as the entry policy chosen by a politician who cares about the economy's output but also responds to bribes in the model by Aghion et al. (2007) about the influence of democracy on economic growth via the channel of market entry and innovation. In their model, the level of democracy affects the entry policy chosen by the politicians in power.

independent of the income they have generated during their time in power and that is set equal to zero for simplicity.[6]

I assume that the probability of being deprived of power depends on several different factors working in different directions and being of different importance in autocracies than in democracies. In particular, I argue that the loyalty of each citizen towards the regime in power increases with her individual net income, independent of the regime form. With increasing loyalty of the citizens the probability of the incumbent regime to be replaced decreases. This is in line with standard assumptions of the political economy literature (Mueller, 2003, ch. 18). In addition to the assumption that increasing individual net income increases the loyalty towards the incumbent regime, I argue that in autocratic countries, there may be a modernization effect that arises when more citizens transition from the poor to the middle class, i.e. when H increases in the model.[7] This modernization effect weakens the loyalty independent from the individual income, since a growing middle class may lead its members to strive jointly for political participation and political changes towards more democracy.[8] In this spirit, keeping people from moving up to the middle class, i.e. from becoming an entrepreneur in this model, serves as a potential measure for the incumbent regime to impede political modernization tendencies.[9] Additionally to this, there is another reason why autocratic regimes may fear a rising middle class, yet not modeled explicitly in this paper. More people shifting from working in a traditional sector to modern sectors leads to a higher complexity of the overall economy, as it is the case when countries move from an agricultural focus to an industrial one. The more complex the economy gets, the more costly repression becomes as complex economies highly require trust of agents in stable institutions which are threatened by coups and riots (Acemoglu and Robinson, 2006, ch. 9).

[6] Alternatively, one could assume that the elite, once overthrown, itself can chose between engaging in the traditional or the modern sector but this would imply that the elite takes into account the effect of their tax and entry barrier decisions on their own income level in the event of a regime change. I abstract from this for the sake of simplicity.

[7] Fidrmuc (2000) finds empirical evidence that in Eastern European transition countries vote shares of parties supporting economic reforms were higher in regions with a relatively large number of entrepreneurs and people with a university degree in the post-communism period of the 1990s. In an older study, Johnson (1961) states that in Latin-America - especially in the urban centers - after World War I a political middle class arose among the qualified and educated population as a competition to the historically rooted elite. Members of this middle class gained political power in Latin-America in the middle of the 19th century and broadened political participation among the citizens by lowering burdens to vote and extending the franchise.

[8] See, among other, Persson and Tabellini (2009) about the relationship between economic development and political transition. In the political economy literature on voting behavior, there is a lot of evidence that not only the individual social and economic status influences voting behavior but also actions of a voter's peer group (Dippel et al., 2015).

[9] If one considers heterogeneous de facto political power among the high-income group or a situation in which entry of new entrepreneurs threatens the profits of the incumbents, an additional channel arises through which higher entry barriers may increase the support of the entrepreneurs for the regime. In this case, incumbent entrepreneurs are likely to be more loyal if the regime chooses a policy to prevent entry from new entrepreneurs. Nevertheless, in the setting of this paper, where an individual entrepreneur's profit does not depend on the number on entrepreneurs in the market, this channel is not of concern.

The probability of a regime change, by regular elections in a democracy or by coups and revolutions in autocratic countries, depends on the support S of the citizens, which itself is a function of the total disposable income of the citizens y, the sectoral composition of the country's non-resource GDP, and the democracy parameter μ which describes, in more general, the state form. I.e,

$$S = f\left(y, L, \mu\right), \tag{8}$$

with $\mu \in (0,1)$[10] and higher values of μ depicting a higher level of democracy. I assume that the level of democracy is exogenously given, at least in the short-run, since this paper does not aim to explain transition processes. The total disposable income of the citizens is depicted as

$$\begin{aligned} y &= (1-\tau)L^{\beta} + (1-\tau)(1-\gamma)\alpha H \\ &= (1-\tau)(1-\gamma)\alpha, \end{aligned} \tag{9}$$

with $L^{\beta-1} = (1-\gamma)\alpha$ again as the equilibrium sectoral composition of the non-resource GDP. In particular, I model the political support function as:

$$S = \frac{yL^{1-\mu}}{\alpha} = (1-\tau)(1-\gamma)L^{1-\mu}, \tag{10}$$

where the term $L^{1-\mu}$ captures the modernization effect. Moreover, the support for the regime depends on the disposable income of the citizens y relative to the maximum possible disposable income α that would be achieved without any state intervention, i.e. without taxes, redistribution, and entry barriers. Expressing the support in this way also yields that S is normalized between zero and one, which makes $1-S$ the probability of the incumbent regime to be removed from office, either by an election in a democracy or a coup in an autocracy. Equation (10) reveals that the more autocratic the country is, i.e. the smaller μ is, the more important becomes the modernization effect and therefore the sectoral composition of the country's non-resource GDP for the support that the regime faces. In contrast to this, in highly democratic countries the modernization effect does not play a role as citizens do not have an incentive to strive for changes in the general political system. In this case, the support of the citizens simply depends on their total disposable income.

Taking a closer look at the patterns of equation (10) after plugging in the equilibrium level of L given equation (6) reveals that the support of the citizens for the regime declines in the

[10] In the easiest case, one could assume that $\mu \in \{0,1\}$, i.e. that democracy vs. autocracy is a binary differentiation. Nevertheless, it does not seem reasonable to assume the existence of perfect autocratic or perfect democratic countries in reality, especially as it is not straightforward what this means virtually.

tax rate independent of the level of democracy, since

$$\frac{\partial S}{\partial \tau} = -(1-\gamma)[\alpha(1-\gamma)]^{\frac{1-\mu}{\beta-1}} < 0 \quad \forall\ \alpha, \beta, \gamma, \mu. \tag{11}$$

With respect to the level of entry barriers, the support of the citizens is less distinct, as the sign of

$$\frac{\partial S}{\partial \gamma} = \frac{[\alpha(1-\gamma)]^{\frac{1-\mu}{\beta-1}}(\beta-\mu)(\tau-1)}{\beta-1} \tag{12}$$

depends on the sign of the term $\beta - \mu$, i.e. the level of democracy relative to the productivity in the traditional sector. In autocratic countries (low levels of μ, $\mu < \beta$), a decline in the level of entry barriers lowers the support of the citizens with this effect being stronger the more productive the traditional sector is relatively to the modern one. The reason for this is that with lower entry barriers, more people strive in the modern sector, which changes the composition of the non-resource GDP and strengthens the modernization effect. This means that from the perspective of an autocratic regime, a relatively more productive modern sector increases the opportunity costs of increasing the entry barriers. The magnitude of the effect decreases as μ, the level of democracy, increases and approaches β, the productivity in the traditional sector. If μ further increases and exceeds β, the marginal effect of γ on S turns negative which means that in relatively democratic countries, increasing the level of entry barriers lowers to citizens' support for the government in power, as higher entry barriers lower their overall disposable income, ceteris paribus.

The aim of the government is to maximize its utility, which I assume to be the product of the political support S and the logarithm of its income Q_E. Income and political support serve as imperfect substitutes to the regime and I consider a standard log-utility of monetary income. With S being normalized between zero and one, the maximization problem of the government is similar to maximizing its expected income.

The structure of the sequential game is as follows. First, the regime sets both the tax rate τ and the bureaucratic burdens for entrepreneurship γ in order to maximize its utility

$$\begin{aligned} U(\gamma, \tau) &= S \cdot \log[Q_E] \\ &= (1-\gamma)(1-\tau)\left[\alpha(1-\gamma)\right]^{\frac{1-\mu}{\beta-1}} \cdot \log[R + \alpha(1-\gamma)\tau]. \end{aligned} \tag{13}$$

On the second stage of the game, the citizens observe the economic conditions and they choose between working in the traditional sector T or becoming an entrepreneur in the modern sector M, which determines L, H, and hence the country's non-resource GDP and tax base Q. At the

last stage of the game, which is not modeled explicitly here, production takes place, income of the citizens and the regime are generated, and the regime either stays in power or gets replaced if political support is too weak.

Solving the model

The second stage solution has already been derived in equation (6) and shows that the number of citizens becoming entrepreneurs decreases in γ, which is straightforward as the profits decrease in increasing entry barriers. On the first stage of the game, the regime maximizes equation (13) w.r.t. the tax rate τ and the level of entry barriers in the modern sector γ. Taking the first order conditions yields

$$\frac{\partial U}{\partial \tau} = \frac{[\alpha(1-\gamma)]^{\frac{\beta-\mu}{\beta-1}}(1-\tau)}{R+\alpha(1-\gamma)\tau} - [\alpha(1-\gamma)]^{\frac{1-\mu}{\beta-1}}\log[R+\alpha(1-\gamma)\tau] = 0$$

$$\Leftrightarrow \alpha(1-\gamma)(1-\tau) = \Omega \tag{14}$$

and

$$\frac{\partial U}{\partial \gamma} = \frac{\tau[\alpha(1-\gamma)]^{\frac{\beta-\mu}{\beta-1}}}{R+\alpha(1-\gamma)\tau} + [\alpha(1-\gamma)]^{\frac{1-\mu}{\beta-1}}\log[R+\alpha(1-\gamma)\tau]\cdot\frac{\beta-\mu}{\beta-1} = 0$$

$$\Leftrightarrow \ \alpha(1-\gamma)\tau = -\frac{\beta-\mu}{\beta-1}\Omega \tag{15}$$

with $\Omega = \log[R+\alpha(1-\gamma)\tau][R+\alpha(1-\gamma)\tau]$.

Equation (14) shows that the marginal regime utility of taxing the citizens decreases in the level of resource rents for all levels of democracy and gets negative if the resource rents exceed a certain threshold. For sufficiently large levels of resource rents, the marginal regime utility of taxing the citizens becomes negative for all levels of productivity, entry barriers, and current tax rate, which is in line with the rentier state theory that governments in resource rich countries tend to tax their citizens less or even use redistribution as a way to consolidate their power. A lot of anecdotic evidence suggests that many resource rich countries, especially the oil abundant nations in the Middle East and the Arab World, exhibit the classical features of rentier economies, namely high dependency on external income (in these cases oil revenues) that coincides with high shares of public spending in national income and weak tax systems (Beblawi and Luciani, 2016).

With respect to the marginal regime utility of the level of entry barriers, the relationship is less clear and more complex. Nevertheless, it can be shown from equation (15) that for autocratic countries (low levels of μ) with a relatively low productive modern sector (low levels

of α) the marginal utility of γ is positive independent from the tax rate and that it is decreasing and becoming even negative for many levels of τ in democratic countries with low levels of resource rents. This means that the decision about the level of entry barriers set by the government depends on both the level of democracy and the level of resource rents.
Inserting equation (15) in (14) yields

$$\tau^* = \frac{\beta - \mu}{1 - \mu}, \tag{16}$$

i.e. that the optimal tax rate set by the government is independent from the level of resource rents but depends on the level of democracy and the productivity of the traditional sector. In particular, τ^* increases in β and decreases in μ which means that, ceteris paribus, autocratic countries with a relatively productive traditional sector implement higher tax rates. Plugging τ^* into equation (14) yields that

$$\frac{\partial U}{\partial \gamma} = \frac{\beta - \mu}{1 - \mu}[\alpha(1-\gamma)]^{\frac{1-\mu}{\beta-1}} \cdot \log(\Psi) - \frac{(1-\beta)(\beta-\mu)}{(1-\mu)^2}\alpha^{\frac{\beta-\mu}{\beta-1}}(1-\gamma)^{\frac{\beta-\mu}{\beta-1}} \cdot \frac{1}{\Psi} = 0 \tag{17}$$

and

$$\frac{\partial^2 U}{\partial \gamma^2} = -\frac{\alpha(\alpha - \alpha\gamma)^{\frac{-2+\beta+\mu}{\beta-1}}(\beta-\mu)\cdot\log[\Psi]}{\beta - 1} + \frac{\alpha^{\frac{\beta}{\beta-1}}(\beta-\mu)^2}{[\alpha(\gamma-1)(\beta-\mu) + (\mu-1)R]^2} \cdot$$

$$\left(-[\alpha(1-\gamma)]^{\frac{\mu}{1-\beta}}\left(\alpha(1-\gamma)^{\frac{\beta}{\beta-1}} + (1-\gamma)^{\frac{1}{\beta-1}}R\right) + \frac{\alpha^{\frac{1}{1-\beta}}(\alpha-\alpha\gamma)^{\frac{1-\mu}{\beta-1}}[\alpha(1-\gamma)(\beta-\mu) + (1-\mu)R]}{\mu - 1}\right)$$

$$< 0 \tag{18}$$

must hold with $\Psi = \frac{\alpha(\gamma-1)(\beta-\mu)}{\mu-1} + R$. As $\log[\Psi]$ is the marginal utility of support, which by definition must be positive, it follows that $\Psi > 1 \Leftrightarrow R > 1 - \frac{\alpha(\gamma-1)(\beta-\mu)}{\mu-1}$ which requires $\beta > \mu$ for very low levels of R. It can be shown that for low levels of R the second order condition in equation (18) requires $\beta > \mu$ to hold, whereas for sufficiently large levels of R it requires $\beta < \mu$ to hold. According to equation (16) it follows that τ^* is negative if $\beta < \mu$, which means that in the presence of sufficiently large levels of resource rents, both democratic and autocratic regimes distribute parts of the rents to the citizens with redistribution being stronger in more democratic countries as equation (16) decreases in μ for $\beta < \mu$. In contrast to that, for low levels of resource rents and $\beta > \mu$, the government imposes a positive tax rate on the citizens. As equation (17) can not be solved analytically for γ^*, the implicit function theorem is applied to calculate

$$\frac{\partial \gamma^*}{\partial R} = -\frac{\partial^2 U / \partial \gamma \partial R}{\partial^2 U / \partial \gamma^2} \tag{19}$$

in order to show how the optimal level of entry barriers changes if R, the level of resource rents, changes.[11] As $\frac{\partial^2 U}{\partial \gamma^2} < 0$ needs to hold at γ^*, the sign of equation (19) depends on the sign of the numerator, namely $\frac{\partial^2 U}{\partial \gamma \partial R}$. With

$$\frac{\partial^2 U}{\partial \gamma \partial R} = \frac{(\beta - \mu)\left(1 + \log\left[\frac{\alpha(\gamma - 1)(\beta - \mu)}{\mu - 1} + R\right]\right)}{\beta - 1} \tag{20}$$

it can be seen that the sign of the effect of an increase in the resource rents variable on the marginal regime utility of the level of entry barriers depends on both the level of democracy and the level of resource rents. Hence, the sign of equation (19) theoretically also depends on both parameters, which is in line with general findings on the so called conditional resource course that the effect of resource rents on economic and political variables depends on the quality of the institutions which is usually found to be higher in democratic countries. Nevertheless, given the aforementioned constraints about the parameters, equation (19) is always negative, which means that for all democracy levels, an increase in resource rents always leads to a reduction of entry barriers. Moreover, the magnitude of $\frac{\partial \gamma^*}{\partial R}$ decreases in μ, meaning that the more autocratic a country is, the stronger will be the liberalization effect of an increase in resource rents. At the same time, depending on the amount of resource rents, more democratic countries will impose relatively lower tax rates or redistribute relatively more to the citizens for high levels of resource rents, respectively.

Summing up, the model predicts that windfall rents from natural resources lead to a decline of the imposed tax rate or, if the rents are sufficiently large, to an increase in redistribution from the government to the citizens with this effect being stronger the more democratic a country is. Therefore, one would expect resource rich democracies to have higher levels of redistribution or provision of public goods, which fits to examples like the *Alaska Permanent Fund* that distributes parts of the oil rents to every citizen and the *Norwegian Government Pension Fund* that invests the surplus revenues of the Norwegian oil sector to save for future generations. The model does not distinguish between different types of redistribution or public goods, which explains why the mentioned result seems to be partly at odds with the theory of the rentier economy that is often observed in resource rich and rather autocratic states. Autocrats may use parts of windfall rents to increase their popularity among the citizens by increasing the provision of public goods. Endrikat (2017) shows that some types of public goods may be more prone to being used as this kind of instrument than others, which suggests that a more differentiated analysis of different types of public goods is necessary instead of only focusing on redistribution

[11] With $F(x, f(x)) = \frac{\partial U}{\partial \gamma}(R, \gamma(R)) = 0$ it follows that $\frac{\partial \gamma}{\partial R}(R) = -\left(\frac{\partial^2 U}{\partial \gamma^2}(R, \gamma(R))\right)^{-1} \cdot \frac{\partial^2 U}{\partial \gamma \partial R}$.

in a broad sense. The second main result of the model is that an increase in the level of resource rents may lead to economic liberalization in the sense of decreasing bureaucratic burdens for entrepreneurship with this effect being stronger in more autocratic countries. Nevertheless, the model does not yield any prediction about the level of bureaucratic burdens depending on both the level of resource rents and the degree of democracy. This explains why this result seems to conflict with the evidence presented in the introduction of this paper which shows that countries rich in natural resources seem to perform worse in terms of entrepreneurial and innovative activity and that this may be partly explained by rent-seeking activities which are especially present in countries with weak institutions (Torvik, 2002).

The results of the presented model are partially at odds with anecdotic evidence and more general findings in the literature on the conditional resource curse that usually tend to find that high levels of natural resource rents lead to political and economic distortions in autocratic countries whereas they rather do not seem to have any effect or even positive effects in democratic countries with good institutions. One potential reason for this may be the absence of a clear time horizon in the simple model. The results suggest that the utility function of the regime in the model may overstate the weight that the regime puts on present income and hence may understate the threat of the modernization effect, respectively. Especially in resource-abundant countries, the discounted present value of the resource reserves can be huge and so can be the benefits from consolidating the political power for forward-looking autocrats. Nevertheless, the model predictions that both the tax rate, the rate of distribution, respectively, and the level of entry barriers are influenced differently depending on the degree of democracy are qualitatively in line with other results from the literature. In order to check the validity of the model predictions, the following sections test the hypotheses empirically.

4 Data and Estimation Strategy

Notwithstanding that the results of the presented model seem to be partly at odds with evidence from the literature on the resource curse, the model nevertheless shows that democratic and autocratic governments may have different incentives to liberalize the economy in the presence of large windfall rents. To empirically test the model results in a more general way, the empirical part of this paper estimates the impact of natural resource rents on the level of and the change in entry barriers and a potential moderating effect of democracy in a reduced form model. Due to missing data on explicit tax rates for a broad set of countries from all income groups and a sufficiently long time period, the joint effect of natural resource rents and the level of democracy on tax rates is not part of the empirical section of this paper. The main focus lies

on regressions exploiting within-country variation, both due to econometric concerns and due to the proximity to the theoretical model, which does not yield distinct results about the level of entry barriers, but only about the way they change in reaction to an increase in rents from natural resources. Nevertheless, to complement these results and to test their robustness, also regressions that additionally make use of between-country variation will be applied as discussed in the following.

4.1 Data Description

The main dependent variable in the empirical model is the *Regulations* sub-indicator from the Economic Freedom dataset provided by the Fraser Institute, which itself consists of three sub-indicators, namely *Credit market regulations*, *Labor market regulations*, and *Business regulations*.[12] The indicator serves as a good measure for the overall level of entry barriers depicted by γ in the theoretical model, as it contains information about the bureaucratic burdens set by the government or official institutions for starting a business and engaging in entrepreneurship. In the robustness checks, a broader but closely related index from the same dataset is used, namely the *Economic freedom summary index*, which is a composite index of five sub-groups, namely *Size of government*, *Legal system & property rights*, *Sound money*, *Freedom to trade internationally*, and *Regulations*. Compared to the first indicator, the second one draws a much broader picture of economic freedom and the quality of the business environment. With respect to the impact of natural resource rents on the two indicators, it is a priori not clear in detail if the additional information about the size of the government and the freedom to trade internationally in the *Economic freedom summary index* depict further dimensions that may be influenced differently by natural resource rents. Nevertheless, it is expected that the empirical results for both indicators are qualitatively similar, since both indicators are highly and significantly correlated ($\rho = 0.8$), which is not surprising given that the first indicator is a component of the second one. The first year for which the Economic Freedom dataset is available is 1970 followed by a period of 30 years with values every fifth year before annual data becomes available from 2000 until 2015. The dataset covers more than 150 countries from all income groups and all regions worldwide and the variables theoretically range from 0 to 10 with higher values indicating less regulation or more economic freedom, respectively. For the period 1970-1999 without annual data, a linear interpolation is used to generate the missing data. The economic freedom variables in the empirical part refer to an inverse measure of the level of entry barriers in the theoretical model.

[12] Table A.1 in the appendix shows pairwise correlations of the three sub-indicators over the whole sample. For detailed information about the dataset, see Gwartney et al. (2018).

The data on natural resource rents, which contains rents from oil, gas, minerals, coal, and forestry, stem from the World Bank. In the regressions, both a measure of resource abundance, the log of per capita resource rents in real US dollars, and a measure of resource dependence, the share of natural resource rents in a country's GDP, are used alternatively. The reason for this is that throughout the resource curse literature there is a prominent debate about different effects of resource abundance and resource dependence, with many scholars claiming that it is mainly resource dependence that may be harmful for a country's development, whereas resource abundance is sometimes even found to be beneficial (Brunnschweiler and Bulte, 2008). Besides the different economic impacts of resource abundance and resource dependence, one also needs to take into account the different econometric concerns that may arise when using these measures as regressors. A measure of resource rents as the share in total GDP is often argued to be potentially endogenous due to omitted variables in regressions that try to estimate the impact on institutional variables. It is argued that unobserved factors may affect both the development of institutions and of the economy, which then in turn directly affects the share of natural resources in total GDP. For that reason, it is often stated that taking rents in dollars per capita mitigates these endogeneity issues in empirical papers on the resource curse (Ross, 2008). Nevertheless, rents from natural resource extraction not only depend on the world price, which could be argued to be exogenous for most countries[13], but also on the country-specific production costs. It is reasonable to assume that these production costs are higher in countries with lower levels of technological development, a fact that could induce endogeneity to the model if rents per capita are used as the main regressor. As there is, for the mentioned reasons, no clear consensus on what the best variable for natural resource rents is in empirical applications, and in order to test whether resource abundance and resource dependence differently affect economic liberalization, both measures are used in the regressions alternatively.

As this paper focuses on a potential moderating effect of the political system on the relationship between natural resource rents and economic liberalization, the Polity2 variable from the PolityIV database issued by the Center for Systemic Peace is used as a moderator variable to capture the overall quality of a country's institutions and in particular the level of democracy, which is one of the main parameters of the theoretical model. The variable measures the degree of democracy/autocracy and originally ranges from -10 to 10 with a higher value indicating a more democratic environment.[14] For the ease of interpretation of the interaction terms in the regressions, the variable is linearly converted such that the most democratic value of 10 is equal to 0 which can be interpreted as the absence of any autocratic structures. The

[13]Even this is not true for all countries, as large oil producing countries, like Saudi Arabia, have enough market power to influence the world oil price with their production quantities.

[14]For detailed information, see Marshall and Elzinga-Marshall (2017).

converted variable theoretically ranges from 0 to 20 with higher values indicating a higher degree of autocracy. Regarding the interpretation of the regression coefficients, this means that the benchmark country is the most democratic one in the sample. Any other control variables, GDP per capita, total population, and secondary school enrollment rate are taken from the World Development Indicators by The World Bank. GDP per capita not only captures a country's income level but also serves as a good proxy for the productivity levels of the model, especially for α, the productivity in the modern sector.

In total, the data sample used in this paper covers the period 1970-2015 and up to 156 countries from all income groups and all regions worldwide. Due to missing data for some country-years in some of the variables, the number of observations differs between the different specifications depending on the set of control variables.

4.2 Descriptive Statistics

Table A.2 in the appendix shows descriptive statistics of the variables of main interest without any transformation. In detail, the variables have the following meanings: REGUL and ECO FREE are the two measures for economic liberalization, PC RENTS is the value of per capita rents from natural resources in real U.S. dollars[15], RENTS GDP is the share of natural resource rents in total GDP, AUTOCRACY is the Polity2 variable[16], GDP PC is the real GDP per capita in U.S. dollars, POPULATION is the total population, and SCHOOLING is the share of children in secondary schools, i.e. the secondary school enrollment rate. As can be seen, all main variables exhibit both substantial between and within variation, although the between variation exceeds the within variation in all cases. Nevertheless, there is sufficient within variation to apply fixed effects regressions that control for unobserved and time-invariant country heterogeneity.

The left panel of figure A.1 in the appendix shows the worldwide trend of economic liberalization starting from 1970 until the recent past. After a period of slight trends towards more regulation during the 1970s and the 1980s, two decades of strong economic liberalization started at the end of the 1980s, before the world financial crisis of the late 2000s has induced a stagnation of this process. From the right panel of figure A.1 it can be seen that there is, on average, a substantial difference in the level of economic liberalization between autocratic and democratic countries with democracies being much more liberalized during the 1970s and 1980s but with autocracies catching up starting from the 1990s up to a level that is still below the

[15] In the regressions, the logarithm of per capita rents is used. As there are countries with zero rents from natural resources, the logs are calculated as $log(resourcerents + 1)$ to avoid the creation of missing data.

[16] As mentioned before, in the regressions, the inverted and transformed variable is used such that higher values depict higher levels of autocracy.

one of democracies but close to it. The graph suggests that processes of economic liberalization took off later in autocratic countries compared to democratic ones but that especially during the 1990s many rather autocratic countries enforced economic liberalization.[17]

4.3 Empirical Strategy

To estimate the impact of natural resource rents on the level of economic freedom and to test for a potential moderating effect of autocracy, a panel model of the form

$$Z_{it} = \alpha_i + \beta_1 RENTS_{it-1} + \beta_2 AUTOCRACY_{it-1} + \beta_3 INTERAC_{it-1} + \boldsymbol{\beta' C_{it-1}} + \delta_t + \epsilon_{it}, \quad (21)$$

is estimated, where Z is the economic freedom variable, $RENTS$ is the natural resource rents variable, $AUTOCRACY$ is the inverted Polity2 autocracy measure, $INTERACT$ is the interaction term between resource rents and autocracy, $\boldsymbol{C}$ is a vector of additional controls, α_i is a country-specific fixed effect, ϵ is the error term, δ is a set of time dummies to capture overall time effects, and i and t are the country and year indices, respectively. Five-year averages of all variables are used to smooth short-term fluctuations and to avoid overidentification due to too many instruments when using the dynamic panel estimator. Therefore, t corresponds to a five-year period, which leads to $T = 9$.[18]

With respect to the empirical strategy, the question arises which estimator is the appropriate one to be used in this model. As commonly known, a fixed effects panel estimator yields unbiased estimates even in the presence of time-invariant unobserved heterogeneity that is correlated with the regressors. Nevertheless, the problem with a fixed effects estimator and the underlying transformation of the data in this setting is that it is not able to capture any level effects of the institutional system, i.e. it is not able to identify whether resource abundance or resource dependence, respectively, have different impacts on economic freedom in autocratic than in democratic countries. For this reason, both fixed effects and random effects regressions are applied to investigate not only within-country but also between-country patterns. Additionally, to account for potential endogeneity and persistence of the dependent variables, a dynamic panel estimator, i.e. the Arellano-Bond two-step system GMM estimator

[17] The countries are categorized according to their average value of the Polity2 measure over the period 1970 until 2015 with the sample median of 3 as the threshold value.

[18] The year 2015 drops out, since the last period corresponds to the years 2010-2014.

(Arellano and Bond, 1991), is used and a model of the form

$$Z_{it} = \alpha_i + \beta_0 Z_{it-1} + \beta_1 RENTS_{it-1} + \beta_2 AUTOCRACY_{it-1} + \beta_3 INTERACT_{it-1} + \boldsymbol{\beta' C_{it-1}} + \delta_t + \epsilon_{it} \tag{22}$$

is estimated. In all specifications, all explanatory variables enter the regressions with a one-period lag to account for adaption processes that are necessary to implement economic policies and to mitigate potential simultaneity concerns in the empirical model. Remember that the autocracy variable is converted such that the most democratic countries have a value of zero for this variable. Hence, β_1 in equation (21) measures the partial effect of natural resource rents on economic freedom in a highly democratic country and β_2 measures the partial effect of autocracy in a country without any rents from natural resources. The main interest lies on the partial effect of natural resource rents on the outcome variable given a certain level of autocracy, so the focus is on the coefficients β_1 and β_3.

The identification strategy is based on the assumption that both the rents from natural resources and the autocracy level are exogenous in the short run, an assumption that can potentially be questioned for both variables. One could think of a positive correlation between economic freedom and the probability of successfully exploring natural resource reserves, if more economic freedom is linked to better property rights or institutions in general, which may attract more foreign direct investment and hence lead to better technological standards in the resource sector. For the case of oil and gas and the likelihood of a field discovery, this issue is controversially debated in the recent literature. As Alsharif and Bhattacharyya (2019) emphasize, giant hydrocarbon discoveries do not seem to depend on national characteristics but rather on international technological changes that make exploration more efficient, which would point to the assumption that a country's level of known resources is independent from its economic and institutional stage of development. The assumption of hydrocarbon discoveries being exogenous is in line with several other recent studies on the political and economic effects of these discoveries (Arezki et al., 2017; Lei and Michaels, 2014; Tsui, 2011). It seems reasonable to suggest that this may also hold for mineral deposits and timber resources.[19] Nevertheless, in a very recent study Arezki et al. (2019) show both theoretically and empirically that the likelihood of a discovery of natural resources may increase as a country liberalizes its economy, which questions the findings of the literature mentioned above. Cust and Harding (2019) also find empirical evidence that institutions may influence natural resource discoveries. In particular, they find evidence that in the oil industry, along country borders exploration

[19]Timber resources partially differ from oil, gas, and minerals as theoretically reafforestation is possible and makes timber a nonfinite resource. Nevertheless, this assumption seems to be plausible only in the long-run, wherefore timber can be seen as a finite resource in the short and medium-run.

companies are more likely to drill for oil on the side of the border that belongs to the country with the relatively better institutions. Nevertheless, it is not clear if this means that countries with better institutions are in general more likely to discover oil or if this only holds true if two neighboring countries with different qualities of institutions are compared directly with each other. In any case, potential endogeneity of natural resource discoveries, which, in turn, would lead to endogeneity of the rents from these resources, may be an issue that is addressed by using a dynamic panel estimator which allows to account for potential endogeneity. Although the mentioned literature only refers to discoveries of oil and gas fields and therefore to oil and gas rents, the same arguments seem to be plausible also for other natural resources, with the exception of timber. Using lags of all explanatory variables in all regression specifications shall further mitigate the problem of potential endogeneity due to reverse causality.

5 Empirical Results

The empirical investigation starts with panel regressions of equation (21) using random effects and fixed effects estimators and of equation (22) using the dynamic panel estimator. Robust standard errors are used in all static specifications and a two-step estimator is applied in all dynamic specifications. In the baseline specification, the log of real GDP per capita is used as an additional control variable to control for a country's income level and its development over time. Running the same specifications without per capita income as a control variable yields qualitatively similar results, which indicates that endogeneity does not seem to be a severe problem with respect to GDP and that leaving out this control variable would not significantly bias the results. Nevertheless, economic reasoning suggests to control for the level of economic development and its change over time which is why the specification including per capita income is the preferred one. The main interest lies on the point estimates of β_1 and β_3 to evaluate the effect of natural resource rents on economic freedom and a potential moderating effect of autocracy.

The effect of resource abundance on economic liberalization

In table 1, resource abundance, in particular the log of per capita rents in real U.S. dollars, is used as the main regressor and the regulation variable is used as the dependent variable. Odd columns show the regression results for specifications without the interaction term between resource rents and autocracy and even columns the results with it included. In absence of the interaction term, the coefficient of the resource abundance variable is negative but highly

insignificant in both the fixed effects and the random effects regressions, whereas the coefficient of the autocracy variable is negative and at least slightly significant in both specifications, indicating that autocratic structures may impede economic liberalization both in a between-country and a within-country comparison. This finding is relativized once the interaction term is included into the regressions. With both random and fixed effects estimators, the coefficient of the interaction term is negative and statistically significant, while both the coefficients of the autocracy variable and those of the rents variable render positive but insignificant with both estimation techniques. These findings indicate that resource abundance seems to negatively affect economic freedom, both its level and its development, in rather autocratic countries, whereas it has no significant effect in rather democratic ones, which is in line with many other general findings in the resource curse literature.

With respect to the magnitude of the effects, a one percent increase in per capita resource rents leads, given a certain level of autocracy $AUTOCRACY_0$, to a change in the regulation variable of $\hat{Z} = \exp[1.01 \cdot \beta_1 + 1.01 \cdot \beta_3 \cdot AUTOCRACY_0] - 1$ percent according to equation (21). Given this, according to column (2), in a highly autocratic country (converted autocracy score of 20, which is equivalent to a Polity2 score of -10), a one percent increase in per capita resource rents leads to a reduction of 0.04 percent[20] in the regulation variable compared to no substantial change[21] in a fully democratic (converted autocracy score of 0, which is equivalent to a Polity2 score of 10) one. Although this effects looks very small, one has to take into account the variation of the per capita rents variable in the sample. A one standard deviation (2,566 U.S. dollars) increase in a highly autocratic country with the sample mean level of resource rents (608 U.S. dollars), which corresponds to an increase of about 322 percent, would lead to a deterioration of the regulation variable of about 12.8 percent[22] compared to a slight increase of 0.02 percent[23] in a theoretically perfect democracy. Even if such a large increase on average seems unlikely, throughout history there have been several cases where countries made large discoveries of new resource reserves that led to sizable inflows of rents in the time after exploration had started.

Moreover, the results provide weak evidence that autocratic tendencies may foster economic liberalization in countries without or with only little income from natural resources as indicated by the positive but insignificant coefficient of the autocracy variable in column (2). This seems plausible as different to pluralistic democracies, in which reforms may be delayed due to political disputes, autocratic regimes face less burdens for the implementation of liberalization

[20] $\exp[1.01 \cdot 0.0075 + 1.01 \cdot (-0.0025) \cdot 20] - 1 = -0.0420$.
[21] $\exp[1.01 \cdot 0.0075] - 1 = 0.0076$.
[22] $\exp[3.22 \cdot 0.0075 + 3.22 \cdot (-0.0025) \cdot 20] - 1 = -0.1278$.
[23] $\exp[3.22 \cdot 0.0075] - 1 = 0.024$.

policies. Two prominent examples are the United Arab Emirates and China, which both have experienced strong tendencies of economic liberalization over the last 15 years in the presence of highly autocratic regime structures.[24] In addition to these main results, it can be seen that the coefficient of the GDP per capita variable is positive and statistically significant in the random effects specifications but insignificant in the fixed effects specifications. This gives some hint to a positive correlation between economic freedom and economic development. As mentioned earlier, due to potential reverse causality, the results should be interpreted with caution when it comes to causality, as they may be biased even with the lagged GDP per capita variable. Although leaving out GDP per capita does not change the main finding of a significantly negative coefficient of the interaction term, this issue is additionally tackled in the dynamic panel GMM regressions.

For the ease of interpretation, the left panel of figure A.2 in the appendix shows a margins plot for specification (2) of table 1 for the two extreme cases, fully democratic and fully autocratic countries with respect to the Polity2 variable. It can be seen clearly that the effect of medium and large flows of resource rents negatively influences the degree of economic freedom in a very autocratic country whereas it has a slightly positive effect in a highly democratic country. For low levels of resource rents, there is no statistically significant difference in the effect between democratic and autocratic countries.

Columns (5) and (6) of table 1 show the results of dynamic panel GMM regressions with the lagged dependent variable as an additional regressor and both autocracy and GDP per capita treated as endogenous. The dynamic panel estimator allows to control for potential endogeneity by using lags of the potentially endogenous variables as internal instruments even if no valid external instrumental variables are available (Roodman, 2009). In particular, the lagged dependent variable, the autocracy variable, and GDP per capita are treated as endogenous, from which follows that the interaction between resource rents and autocracy becomes endogenous as well. Hence, these four variables are instrumented by their own lags in the dynamic panel estimations. Potential endogeneity of the autocracy variable could stem from reverse causality. Economic freedom enables people to become economically independent and to accumulate wealth, which may then lead to more political participation and more de facto political power (Acemoglu and Robinson, 2008), which is one of the channels that may motivate autocrats to impede economic liberalization and is a main assumption in this paper. Adding the lagged dependent variable additionally allows to control for potential persistence of the business environment variable, which seems plausible if one assumes that processes of economic liberalization can be very lengthy especially in democracies with pluralistic decision making. As can

[24]Both countries are categorized as autocracies according to the Polity2 score with values of -8 and -7, respectively.

be seen from the coefficients in column (6), the previous result of the negative interaction term is robust to controlling for potential endogeneity and for persistence of the economic freedom variable. The coefficient of the lagged dependent variable is highly significant and positive but not very close to one, both in the specification with and without the interaction term, which reveals a moderate persistence of the dependent variable even with 5-year averages of the data. Moreover, the coefficient of per capita GDP stays positive and at least weakly significant, but shrinks in its magnitude, which indicates that in a non-dynamic setting parts of the persistence effect are attributed to economic development which leads to an overestimation of the effect of economic development on economic liberalization. Different to the non-dynamic regressions, the coefficient of the resource rents variable becomes significantly positive in the dynamic setting, indicating that in highly democratic countries, resource abundance may even promote economic liberalization. The statistics of the Hansen Test show that there is no problem of overidentification of the model.

The results of the dynamic panel regression enable the estimation of the long-run effect of an increase of resource rents on economic liberalization given a particular level of autocracy. Given equation (22), the long-run effect of a one standard deviation increase (increase by factor 3.22) in per capita resource rents, for example after the discovery of large reserves, at a given level of autocracy $AUTOCRACY_0$ can be calculated as

$$\hat{Z}_{LR} = \frac{\exp[3.22 \cdot \beta_1 + 3.22 \cdot \beta_3 \cdot AUTOCRACY_0] - 1}{1 - \beta_0}.$$

Given the estimated coefficients in column (6) of table 1, this means a reduction of about 0.12 percent in the economic freedom variable in the most autocratic country compared to an increase of about 0.13 percent in the most democratic one in the long run. Notwithstanding the small magnitude of the effects, one should notice that there is evidence in the literature that resource rents itself may lead to lower levels of democracy, which could further strengthen the observed effects (Tsui, 2011).

The effect of resource dependence

Throughout the resource curse literature, there is a prominent discussion about whether it is resource rents per se or rather an economy's dependence on them that causes several resource rich countries to economically underperform. With respect to processes of economic liberalization, it does not seem straightforward whether resource abundance and resource dependence may have different effects. With respect to resource dependence, several channels working in different directions seem plausible. On the one hand, a government which highly depends on

income generated from selling natural resources may have an incentive to diversify the domestic economy and therefore to foster economic liberalization to promote entrepreneurship. This would help to make future government revenues less vulnerable to fluctuations in international resource prices, independent of the political regime. On the other hand, an autocratic regime may, if it underestimates the uncertainty of future resource prices, have an incentive to impede economic liberalization if the elite fears that economic freedom leads to more economic power distributed among the citizens which may give them more de facto political power (Acemoglu and Robinson, 2008). In the model presented in this paper, for the regime in power, rents from natural resources serve as a substitute for income generated from taxing the non-resource sectors, which argues for a measure of resource dependence in the empirical part. Nevertheless, the model does not directly relate resource income to non-resource income, which pleads for using an absolute measure of resource rents instead. Moreover, a measure for resource rents relative to a country's total GDP is more likely to suffer from endogeneity issues than an absolute measure, as a high degree of resource dependence may stem either from large absolute inflows of resource rents or from depressed non-resource sectors, or from both. High entry barriers demotivate agents to engage in entrepreneurship, which may induce reverse causality into the model when using the resource dependence variable even with lagged values of all regressors. Since there is no distinct answer from the model which kind of resource measure should be used to empirically test the predictions, both resource abundance and resource dependence are used in the empirical part of this paper.

Table 2 shows the estimation results of equations (21) and (22) with the share of natural resource rents in total GDP as the resource variable. Again, the specifications in the even columns contain the interaction term of resource dependence and autocracy that is left out in the odd ones. As with resource abundance, there is no clear evidence that resource dependence affects economic liberalization in democratic countries, which can be seen from the mostly insignificant coefficients of the resource rents variable. If at all, there may be a weak positive effect as indicated by the dynamic panel estimation in column (6). Nevertheless, the coefficient of the interaction term is negative and at least slightly significant in all cases, which points to a negative effect of resource dependence in non-democratic countries. Throughout the three different specifications that contain the interaction term, the level of autocracy after which the effect of resource dependence becomes negative lies between around 6 and 7, which corresponds to values between 3 and 4 on the original Polity2 scale and depicts modest anocracies. With respect to the magnitude of the effect, according to column (2), a one percentage point increase in the share of resource rents in total GDP leads, on average, to a decrease of 0.38 percent[25] in

[25] $100 \cdot (\exp[(0.0022 + (-0.0003) \cdot 20)] - 1) = -0.38$.

the economic liberalization measure in the most autocratic countries compared to an increase of about 0.22 percent[26] in the most democratic ones. A one standard deviation (11.09 percentage points) increase in resource dependence would, respectively, lead to a decrease of about 4.2 percent in the most autocratic country and an increase of about 2.4 percent in a perfect democracy. The right panel of figure A.2 in the appendix shows a margins plot for specification (2) of table 2 for the two extreme cases, fully democratic and fully autocratic countries with respect to the Polity2 variable and visualizes the mentioned results.

Consistent with the results from table 1, the coefficient of the GDP per capita variable is positive and significant in four out of six specifications and smaller in terms of magnitude in the dynamic regressions, which supports the previous findings. Moreover, the moderate persistence of economic freedom is underlined by the positive and highly significant coefficients of the lagged dependent variable in columns (5) and (6) with very similar magnitudes as in the specifications with resource abundance. Similar to the results for resource abundance, there seems to be a weak positive effect of resource dependence on economic liberalization in moderate and highly democratic countries as pointed out by the significantly positive coefficient of the resource rents variable in column (6). This further supports the hypothesis that natural resources do not impede economic liberalization per se. In general, the results of the baseline regressions indicate a negative joint effect of resource abundance and autocracy on economic freedom, whereas the observed effect is only very weak in the case of resource dependence. Taking into account that resource dependence is measured in percent of GDP, the long run effect of a one standard deviation increase in the resource dependence variable (11.09 percentage points) on the economic freedom variable given a certain level of autocracy $AUTOCRACY_0$ can be calculated as

$$\hat{Z}_{LR} = \frac{11.09 \cdot 100 \cdot (\exp[\beta_1 + \beta_3 \cdot AUTOCRACY_0] - 1)}{1 - \beta_0}.$$

Given the coefficient estimates in column (6) of table 2, this implies that a one standard deviation increase in resource dependence leads to a 2.62 percent decrease of the economic liberalization variable in a highly autocratic country in the long run, compared to an increase of 2.62 percent in a highly democratic country.

The main finding of the presented results, a negative interaction effect of natural resource rents and autocracy, is in line with a lot of anecdotic evidence and the results in many other papers throughout the resource curse literature, which state that several channels of a potential curse are more likely to occur in less democratic countries. The significantly negative coefficient of the interaction term holds over all specifications both for per capita resource rents and the

[26] $100 \cdot (\exp[0.0022] - 1) = 0.22$.

share of resource rents in GDP from which follows that with respect to economic liberalization, it does not seem to be necessary to distinguish between resource abundance and resource dependence, even if the empirical results are stronger for resource abundance. With a statistically significant value of 0.63 in the data sample, both resource variables reveal a quite strong correlation, which further explains why the results do not differ significantly over the different specifications.

Table 1: Regression results - baseline specification with resource abundance as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
LOG PC RENTS$_{t-1}$	-0.0037	0.0075	-0.0032	0.0069	0.0039*	0.0154***
	(-0.36)	(0.69)	(-0.58)	(1.07)	(1.95)	(6.50)
AUTOCRACY$_{t-1}$	-0.0036*	0.0063	-0.0037**	0.0024	-0.0003	0.0035***
	(-1.76)	(1.58)	(-2.23)	(0.75)	(0.42)	(2.68)
INTERACT$_{t-1}$		-0.0025**		-0.0014**		-0.0015***
		(-2.61)		(-2.16)		(-4.96)
LOG GDP PC$_{t-1}$	0.0488	0.0628	0.0457***	0.0491***	0.0119***	0.0054*
	(1.30)	(1.59)	(5.01)	(5.28)	(3.46)	(1.77)
LOG REGUL$_{t-1}$					0.604***	0.606***
					(21.05)	(33.11)
Observ.	830	830	830	830	746	746
Countries	146	146	146	146	132	132
r^2	0.528	0.538	0.402	0.402		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.320$	$Pr > \chi^2 = 0.283$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table 2: Regression results - baseline specification with resource dependence as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
RENTS GDP$_{t-1}$	-0.0017	0.0022	-0.0010	0.0019	-0.0002	0.0010**
	(-1.35)	(0.93)	(-1.20)	(1.02)	(-0.80)	(2.51)
AUTOCRACY$_{t-1}$	-0.0037*	-0.0016	-0.0036**	-0.0019	-0.0011	-0.0013**
	(-1.80)	(-0.72)	(-2.14)	(-0.90)	(-1.36)	(-2.19)
INTERACT$_{t-1}$		-0.0003**		-0.0002*		-0.0001***
		(-2.06)		(-1.73)		(-4.98)
LOG GDP PC$_{t-1}$	0.0427	0.0531	0.0432***	0.0484***	0.0123***	0.0123***
	(1.17)	(1.41)	(4.94)	(4.78)	(3.24)	(3.85)
LOG REGUL$_{t-1}$					0.596***	0.577***
					(21.73)	(29.83)
Observ.	830	830	830	830	746	746
Countries	146	146	146	146	132	132
r^2	0.529	0.536	0.402	0.398		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.315$	$Pr > \chi^2 = 0.283$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

6 Robustness Checks

In the following part of this paper, several robustness checks are conducted to test the validity of the empirical results. The baseline regressions have shown that both resource abundance and resource dependence may affect economic freedom, both its levels and its development and that this effect depends on the regime characteristics, i.e. the level of autocracy.

Adding further control variables

To rule out that the previous results are driven by omitted variables, further control variables are added to the model as a first robustness check. In particular, logarithmized population, secondary school enrollment rates, and an OECD dummy are included. Some - with respect to population - rather small countries of the sample have become well-known over time as tax havens and countries with very liberal economic policies to attract foreign capital, especially in the banking sector. The long time span of the sample covers periods of strong international financial integration, which incentivized these countries to liberalize their economies in order to generate comparative advantages in the financial sector, an important source of income for countries whose labor force is too small for classical industries to emerge. A higher educational level of the general population may, ceteris paribus, increase the marginal benefits of economic liberalization, since better educated citizens are more likely to become successful entrepreneurs, which, in turn, increases the overall tax base. Additionally, better educated citizens may participate more intensively in the political process and therefore exert more pressure on the regime for political and economic reforms. The OECD membership dummy does not reveal much within-country variation, as more than half of the OECD countries included in the sample have been members over the whole period. Nevertheless, some countries have become members during the sample period, wherefore the dummy is not completely time-invariant and may explain both within and between-variation in the dependent variable. OECD countries in the sample are, on average, less abundant in and less dependent on natural resources, more democratic, and perform better in terms of economic freedom, which is not surprising, as many of these aspects are directly or indirectly targeted by the OECD mission[27]. Tables A.3 and A.4 in the appendix show that the coefficients of both the population variable and the OECD dummy reveal the expected sign and are significant in most of the specifications. OECD membership leads to more economic freedom both between and within countries and countries with a smaller population size are, on average, more economically liberalized than larger countries. Moreover, there is weak evidence that a higher level of education fosters economic development, as the

[27] `https://www.oecd.org/about/`, retrieved on 22.08.2019.

coefficient is positive and statistically significant in the dynamic panel regressions. This is also in line with the assumptions about the potential mechanisms mentioned above. The main findings are robust to controlling for population size and OECD membership. Both for resource abundance and resource dependence, the coefficient of the interaction term between resource rents and autocracy is negative and at least slightly significant in most of the specifications, indicating that increasing rents may impede economic liberalization in non-democracies, while they do seem to have no or even a slightly positive effect in democracies.

OLS regressions with first-differences

Both fixed effects and random effects regressions have been applied to test whether the predictions of the theoretical model are supported by the data. Additionally, a dynamic panel estimator was used to account for persistence of the dependent variable and potential endogeneity. The main purpose of using fixed effects estimations is to eliminate potential unobserved time-invariant heterogeneity between countries, which causes endogeneity if it is correlated with the regressors. Another way of doing this is to estimate an equation of the form

$$\Delta Z_{it} = \beta_1 \Delta RENTS_{it-1} + \beta_2 \Delta AUT_{it-1} + \beta_3 \Delta (RENTS * AUT)_{it-1} + \boldsymbol{\beta' \Delta C_{it-1}} + \delta_t + \epsilon_{it}, \quad (23)$$

using simple OLS regressions, where Δ depicts the first-difference of the respective variable. As in the baseline regressions, the lagged structure is maintained to account for potential lags in the adjustment process of economic liberalization and period dummies are included to control for overall time trends. Table A.5 in the appendix shows that the interaction term between resource rents and autocracy stays negative and statistically significant in the case of resource rents per capita and negative but insignificant in the case of resource rents as a share of GDP. One potential reason for the insignificant interaction effect in the latter two columns may be the number of observations in the first-difference regressions that is by construction lower than in the case of fixed effects or random effects regressions.

Alternative measure of economic freedom/economic liberalization

In tables A.6 and A.7 in the appendix, the baseline specifications are replicated with the Fraser *Economic Freedom Summary Index*, which draws a broader picture of economic freedom than its sub-indicator *Regulation*, as the dependent variable. In particular, the *Economic Freedom Summary Index* also contains information about the level of taxes, subsidies, the importance of government enterprises, the quality of the legal and the financial system, and the

level of trade regulations. Both indicators exhibit a strong and significant correlation of 0.8. For the case of resource abundance, the main result from the baseline regressions, the negative interaction term, is supported by the results (table A.6), whereas in the case of resource dependence, the coefficient of the interaction term renders insignificant in all specifications (table A.7). Nevertheless, at least for resource abundance, the results are robust to using a different measure of economic freedom as the dependent variable. Due to the additional components of the composite indicator, especially the information about the level of overall taxes, the preferred variable to measure the degree of economic freedom in a sense of low business regulation is the one used in the baseline specifications.

Resources excluding timber

Throughout this paper, the term natural resource rents refers to the sum of rents from subsoil resources, namely hydrocarbons and minerals including coal, and rents from the timber industry. This measure is commonly used in the resource curse literature as it serves as a good indicator both for the abundance in and the dependence on rents from non-renewable natural resources. Being exhaustible and non-renewable makes these types of resources and their rents different to income from agricultural products, which has been highlighted in many different economic concepts, such as Hotelling's rule and Hartwick's rule (Hartwick, 1977; Hotelling, 1931). Depending on the time horizon and the type of the timber industry, whether primeval forests or secondary forests are lumbered, one may argue that rents from the forestry industry differ from those of non-renewable resources in terms of their economic and political effects. For some countries of the data sample, mainly African countries, rents from forestry make up a large share of their GDP. In 2015, Ethiopia (11.8 %), Guinea-Bissau (19.9 %), and The Central African Republic (14.6 %), to name just a few examples, generated more than ten percent of their state income from timber activities. To rule out that the results are partly driven by an "Africa Effect", the baseline regressions are performed with resource rents excluding forestry as the main regressor. Tables A.8 and A.9 in the appendix show the results for resource abundance and resource dependence, respectively. The results for the case of resource abundance are very similar to the ones of the baseline specifications, i.e. the interaction term stays negative and at least slightly significant in all specifications, but loses a bit in magnitude. Moreover, the weak evidence that resource abundance may even foster economic liberalization in medium and highly democratic countries is also robust to excluding rents from forestry from the analysis as indicated by column (6) of table A.8 . When resource dependence is used instead of resource abundance, the results are qualitatively similar, but the coefficient of the interaction

term loses its significance in two out of three specifications. Nevertheless, in the dynamic panel specification, the main findings are supported with the subsoil resource rents measure.

Excluding former Soviet Union states

The data sample used in this paper covers a long time span over several decades, including periods of worldwide slow economic liberalization or even slight deliberalization tendencies in the 1980s, up to periods of strong liberalization in the 1990s and the beginning of the 2000s (see figure A.1 in the appendix). Right at the beginning of the liberalization decades, the former Soviet Union collapsed and several newly independent states emerged, many of them being resource rich, such as Azerbaijan, Turkmenistan, and Russia. To make sure that the baseline results of the empirical investigation are not driven by resource rich former Soviet Union states that went through a transition process during the period of strong worldwide liberalization, the regressions are rerun excluding all former Soviet Union member states[28]. The results are shown in tables A.10 and A.11 in the appendix. The main results are robust to the exclusion of these countries, i.e. both resource abundance and dependence slow down economic liberalization in autocratic countries while they may foster it in democratic ones.

Using yearly data instead of 5-year averages

Instead of using yearly data for the regressions, 5-year averages of all variables are used in the baseline regressions as stated above. The main reason for this is that due to the long sample period, with yearly data the number of instruments in the GMM regressions highly exceeds the number of groups (countries) in the sample. Manually restricting the depth of the lags that are used as instruments avoids this problem, but may lead to invalid instruments as the previous results have shown that there is a moderate persistence in the dependent variable. With 5-year averages of the data, using lags 2-4 as instruments refers to using data from the previous 15 years, which is likely to increase the degree of exogeneity of the instruments compared to the situation where only the previous four years are used as instruments. Although there is no clear evidence in the literature on the maximum number of instruments relative to the number of groups in a GMM regression, scholars agree on avoiding too many instruments and paying attention to the automatic warning by STATA if the number of instruments exceeds the number of groups. As a robustness check, the main specifications are run with yearly data using fixed effects and random effects estimators. Tables A.12 and A.13 in the appendix report the results

[28]The excluded countries are: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

for resource abundance and resource dependence, respectively. For the aforementioned reason, in the case of yearly data, only fixed and random effects estimators are used. As can be seen, both for resource abundance and resource dependence as the rents variable, the interaction term with autocracy is negative but only significant in the case of resource abundance, which partly underlines the previous findings.

Overall, the baseline results are robust to different specifications, different country samples, and different estimation techniques, at least in the case when resource abundance is used as the main regressor. For resource dependence, the results are not as clear, but qualitatively, it does not seem to be of huge importance to distinguish between resource abundance and resource dependence.

7 Conclusion

This paper contributes to the exiting literature on the conditional resource curse by both theoretically and empirically investigating the effect of rents from natural resources on the level of economic freedom in terms of entry barriers for new firms and how this is moderated by the level of democracy. First, a simple model of natural resource rents, entry barriers, and taxation is established, where the level of entry barriers set by the regime influences both the tax base and the size of the middle class, which here refers to the share of entrepreneurs among the population. Depending on the level of democracy, the regime in power may try to impede citizens from transitioning from the low-income class to the middle class, because a broader middle class may increase the general demand for political modernization among the population. The measure to achieve this is to set high entry barriers for potential entrepreneurs and hence keep them working in the traditional sector. As the traditional sector is considered to be less productive than the entrepreneurial one, the regime faces a trade-off between raising the tax base and keeping the demand for political change low. In the presence of large windfall rents, modeled here as rents from natural resources, the opportunity costs of increasing the entry barriers decline, as the rents serve as a substitute for tax income for the regime.

The model predicts that rents from natural resources lead to a decline in entry barriers with this effect being stronger the more autocratic a country is. Notwithstanding that this result is somehow at odds with anecdotic and statistical evidence about the differences in the level of innovative capacity between different countries, it still shows that the level of democracy may work as a moderator variable, which is in line with many other results from the resource curse literature.

In the second part of the paper, the model predictions are tested empirically using regres-

sion analyses with different measures for natural resource rents, the level of autocracy, and the interaction of both as the main regressors and the level of entry barriers as the dependent variable in a sample of about 150 countries over the time period 1970 until 2015. With respect to the deteriorating effect of natural resource rents in autocracies on the business environment, the empirical results contradict the model predictions as they show a statistically significant negative interaction effect of natural resource rents and autocratic regime structures. The results are more clear-cut in the case when a measure of resource abundance rather than one for resource dependence is used, but overall it does not seem to be of great importance to distinguish between resource abundance and resource dependence. The empirical findings are robust to using different country samples and different estimation techniques that control for unobserved country heterogeneity, potential endogeneity of the autocracy variable, and for potential persistence of the dependent variable in a dynamic setting. Nevertheless, the magnitude of the empirical results is rather small. According to the estimated coefficients, a one standard deviation increase in the share of resource rents in total GDP, for example after a discovery of large resource reserves, would ceteris paribus lead to a long-run improvement of 2.6 percent in the business environment measure in a highly democratic country compared to a long-run deterioration of about the same size in a highly autocratic one. Nevertheless, as several other studies have shown, rents from natural resources may impede democratization tendencies and thus strengthen autocratic regimes which would further fuel the presented channel and multiply the magnitude of the long-run effect. Overall, the empirical results of this paper are in line with much of the literature that states that rents from natural resources do not seem to harm an economy per se but that the behavior of the regime in power, in particular the incentives it sets, matters in this context. Although it is not the aim of this paper to answer the question if and under which circumstances countries should liberalize their economy in general, it seems straightforward that high entry barriers for new firms set by an autocratic regime as a way to consolidate its power may lead to low economic performance, less innovative capacity, and less economic diversification. All of these aspects have been found in the literature to be potential symptoms of the resource curse. High entry barriers are likely to further encourage citizens to engage in rent-seeking, a behavior that has been shown in the literature to likely occur in resource rich countries with low overall institutional quality. Both channels together - rent-seeking behavior and the creation of high business entry barriers by the government - have the potential to lead to highly inefficient economic outcomes, which underlines that improving the quality of the institutions may help less developed resource rich countries to fully exploit their existing potential.

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8 Appendix

Table A.1 : Pairwise correlations of Fraser regulation sub-categories

	Credit market regulations	Labor market regulations
Labor market regulations	0.259***	
	(0.000)	
Business regulations	0.426***	0.393***
	(0.000)	(0.000)

p values in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. All pairwise correlations refer to the original data without interpolation or any transformation.

Figure A.1 : Economic liberalization trends worldwide

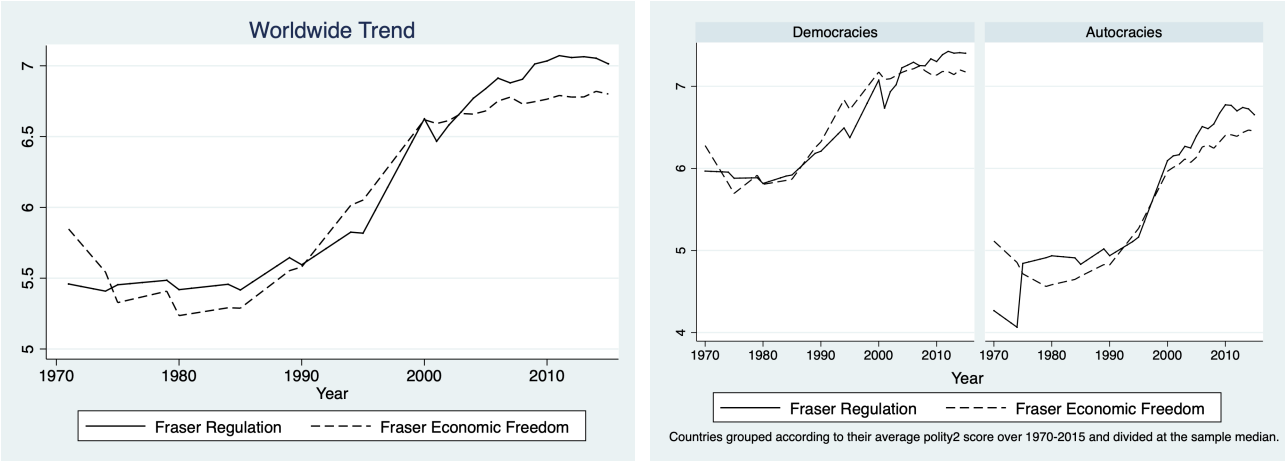

Figure A.2 : Margins plots

The effect of resource rents on the business environment - Democracies vs. autocracies

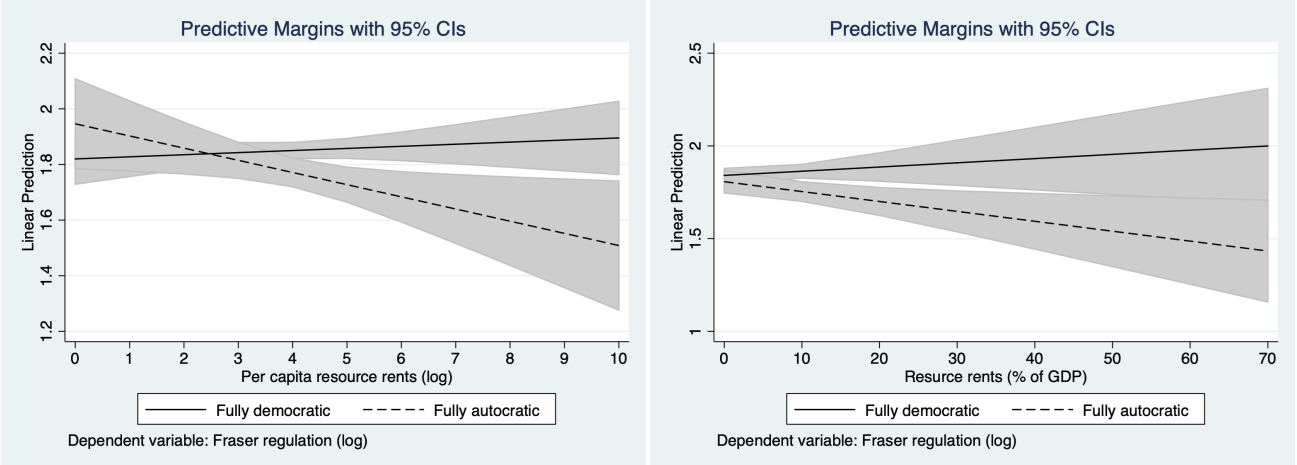

Table A.2 : Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Obs.	Period
REGUL	overall	06.20	1.36	1.00	9.42	N=5047	1970-2015
	between		1.02	3.64	8.42	n=156	
	within		0.87	2.75	9.81	$\bar{T} = 32.35$	
ECO FREE	overall	6.13	1.29	1.97	9.19	N=5102	1970-2015
	between		0.94	3.70	8.76	n=156	
	within		0.83	2.75	8.39	$\bar{T} = 32.70$	
PC RENTS	overall	608.7	2566.1	0	59410.3	N=6978	1970-2015
	between		2650.6	0	22339.8	n=182	
	within		1302.0	-9315.2	47746.8	$\bar{T} = 38.43$	
RENTS GDP	overall	7.09	11.09	0	89.59	N=7557	1970-2015
	between		9.61	0	46.41	n=196	
	within		5.69	-30.76	70.22	$\bar{T} = 38.55$	
AUTOCRACY	overall	0.99	7.40	-10	10	N=7684	1970-2015
	between		6.02	-10	10	n=161	
	within		4.39	-13.04	15.41	$\bar{T} = 47.72$	
GDP PC	overall	10145.89	15515.8	115.4	115003.4	N=7964	1970-2015
	between		14514.0	247.7	68067.8	n=182	
	within		5757.1	-25160.6	58031.3	$\bar{T} = 43.75$	
POPULATION	overall	2.89e+07	1.12e+08	11481	1.37e+09	N=8621	1960-2015
	between		1.10e+08	16273.43	1.14e+09	n=188	
	within		2.23e+07	-3.39e+08	4.14e+08	$\bar{T} = 45.86$	
SCHOOLING	overall	63.30	34.10	0	166.15	N=5824	1971-2015
	between		31.44	6.63	136.07	n=186	
	within		15.59	2.42	134.56	$\bar{T} = 31.31$	

All descriptive statistics refer to the original data without any transformation besides the linear interpolation of the two business regulation variables REGUL and ECO FREE.

Table A.3 : Robustness Checks - further control variables, resource abundance as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
LOG PC RENTS$_{t-1}$	0.0013	0.0123	0.0023	0.0118*	0.0048**	0.0119***
	(0.12)	(1.07)	(0.40)	(1.90)	(2.13)	(5.21)
AUTOCRACY$_{t-1}$	-0.0033	0.0071*	-0.0033*	0.0028	-0.0012	0.0015
	(-1.45)	(1.67)	(-1.93)	(0.84)	(-1.45)	(1.10)
INTERACT$_{t-1}$		-0.0026***		-0.0014**		-0.0010***
		(-2.62)		(-2.15)		(-3.49)
LOG GDP PC$_{t-1}$	0.0106	0.0302	0.0192	0.0277*	0.0022	-0.0062
	(0.19)	(0.50)	(1.23)	(1.67)	(0.28)	(-1.26)
LOG POPULATION$_{t-1}$	-0.0824	-0.0640	-0.0332***	-0.0344***	-0.0114***	-0.0121***
	(-1.18)	(-0.93)	(-4.10)	(-4.17)	(-4.52)	(-6.83)
OECD$_{t-1}$	0.0811**	0.0765**	0.0822***	0.0685**	0.0232*	0.0195***
	(2.05)	(2.35)	(2.74)	(2.37)	(1.79)	(2.77)
SCHOOLING$_{t-1}$	0.0003	0.0002	0.0004	0.0003	0.0008***	0.0008***
	(0.52)	(0.39)	(0.86)	(0.57)	(3.29)	(5.25)
LOG REGUL$_{t-1}$					0.494***	0.522***
					(16.33)	(32.86)
Observ.	758	758	758	758	677	677
Countries	143	143	143	143	128	128
r^2	0.535	0.546	0.438	0.436		
Instruments					79	100
AR(2)					$Pr > z = 0.001$	$Pr > z = 0.001$
Hansen test of overid.					$Pr > \chi^2 = 0.350$	$Pr > \chi^2 = 0.476$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.4 : Robustness Checks - further control variables, resource dependence as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
RENTS GDP$_{t-1}$	-0.0015	0.0027	-0.0007	0.0021	0.0001	0.0010*
	(-1.09)	(1.05)	(-0.73)	(1.03)	(0.33)	(1.90)
AUTOCRACY$_{t-1}$	-0.0034	-0.0012	-0.0031*	-0.0015	-0.0014	-0.0022***
	(-1.50)	(-0.52)	(-1.81)	(-0.70)	(-1.56)	(-3.29)
INTERACT$_{t-1}$		-0.0004**		-0.0002		-0.00007*
		(-2.06)		(-1.50)		(-1.86)
LOG GDP PC$_{t-1}$	0.0056	0.0130	0.0220	0.0265	0.0042	-0.0046
	(0.10)	(0.23)	(1.44)	(1.63)	(0.54)	(-0.95)
LOG POPULATION$_{t-1}$	-0.0826	-0.0970	-0.0330***	-0.0340***	-0.0119***	-0.0124***
	(-1.20)	(-1.43)	(-4.06)	(-4.08)	(-4.61)	(-7.39)
OECD$_{t-1}$	0.0798**	0.0870**	0.0765**	0.0786**	0.0167	0.0183**
	(2.06)	(2.34)	(2.47)	(2.55)	(1.33)	(1.98)
SCHOOLING$_{t-1}$	0.0003	0.0003	0.0004	0.0003	0.0008***	0.0011***
	(0.46)	(0.44)	(0.68)	(0.65)	(3.06)	(6.62)
LOG REGUL$_{t-1}$					0.499***	0.512***
					(16.70)	(30.55)
Observ.	758	758	758	758	677	677
Countries	143	143	143	143	128	128
r^2	0.536	0.544	0.437	0.433		
Instruments					79	100
AR(2)					$Pr > z = 0.001$	$Pr > z = 0.001$
Hansen test of overid.					$Pr > \chi^2 = 0.328$	$Pr > \chi^2 = 0.560$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.5 : Robustness Checks - OLS regression of first-differences with robust standard errors

	(1) ΔLOG REGUL	(2) ΔLOG REGUL	(3) ΔLOG REGUL	(4) ΔLOG REGUL
ΔLOG PC RENTS$_{t-1}$	0.00719	0.00929		
	(1.03)	(1.29)		
ΔRENTS GDP$_{t-1}$			0.00118	0.00008
			(0.69)	(0.05)
ΔAUTOCRACY$_{t-1}$	0.00284	0.00430	-0.00210	-0.00142
	(1.00)	(1.42)	(-1.48)	(-0.93)
ΔINTERACT$_{t-1}$	-0.00149**	-0.00161**	-0.00016	-0.00013
	(-2.07)	(-2.10)	(-1.31)	(-1.02)
ΔLOG GDP PC$_{t-1}$	-0.0180	-0.0467	-0.0258	-0.0545
	(-0.51)	(-1.03)	(-0.75)	(-1.26)
ΔLOG POPULATION$_{t-1}$		-0.123**		-0.127**
		(-2.04)		(-2.15)
ΔOECD$_{t-1}$		0.0648**		0.0646**
		(2.44)		(2.44)
ΔSCHOOLING$_{t-1}$		0.00037		0.00030
		(0.63)		(0.51)
Observ.	684	600	684	600
r^2	0.266	0.269	0.262	0.265
F	20.37	15.95	20.13	15.47
Prob > F	0.000	0.000	0.000	0.000

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends.

Table A.6 : Robustness Checks - alternative measure of economic freedom, resource abundance as main regressor

	(1) LOG ECO FREE FE	(2) LOG ECO FREE FE	(3) LOG ECO FREE RE	(4) LOG ECO FREE RE	(5) LOG ECO FREE GMM	(6) LOG ECO FREE GMM
LOG PC RENTS$_{t-1}$	-0.0076	0.0035	-0.0130**	-0.0024	0.0015	0.0072***
	(-0.71)	(0.33)	(-2.41)	(-0.43)	(0.75)	(3.47)
AUTOCRACY$_{t-1}$	-0.0072***	0.00201	-0.0072***	-0.0010	-0.0066***	-0.0012
	(-3.11)	(0.51)	(-4.38)	(-0.33)	(-9.25)	(-1.15)
INTERACT$_{t-1}$		-0.0023**		-0.0013**		-0.0008***
		(-2.41)		(-2.24)		(-4.23)
LOG GDP PC$_{t-1}$	0.0014	0.0125	0.0586***	0.0615***	-0.00244	-0.0019
	(0.05)	(0.40)	(10.45)	(11.19)	(-0.79)	(-1.09)
LOG ECO FREE$_{t-1}$					0.696***	0.720***
					(28.28)	(53.83)
Observ.	842	842	842	842	766	766
Countries	146	146	146	146	132	132
r^2	0.563	0.570	0.585	0.588		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.044$	$Pr > \chi^2 = 0.121$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.7 : Robustness Checks - alternative measure of economic freedom, resource dependence as main regressor

	(1) LOG ECO FREE FE	(2) LOG ECO FREE FE	(3) LOG ECO FREE RE	(4) LOG ECO FREE RE	(5) LOG ECO FREE GMM	(6) LOG ECO FREE GMM
RENTS GDP$_{t-1}$	-0.0034**	-0.0008	-0.0029***	-0.0011	-0.0002	-0.0008**
	(-2.25)	(-0.27)	(-2.86)	(-0.45)	(-1.04)	(-2.03)
AUTOCRACY$_{t-1}$	-0.0073***	-0.0059**	-0.0068***	-0.0057***	-0.0070***	-0.0054***
	(-3.18)	(-2.56)	(-3.97)	(-3.11)	(-9.75)	(-13.55)
INTERACT$_{t-1}$		-0.0002		-0.0001		0.00003
		(-1.34)		(-0.96)		(0.90)
LOG GDP PC$_{t-1}$	-0.0109	-0.0042	0.0511***	0.0540***	-0.0008	0.0003
	(-0.37)	(-0.14)	(9.63)	(9.00)	(-0.27)	(0.14)
LOG ECO FREE$_{t-1}$					0.688***	0.710***
					(27.96)	(49.99)
Observ.	842	842	842	842	766	766
Countries	146	146	146	146	132	132
r^2	0.567	0.570	0.590	0.589		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.043$	$Pr > \chi^2 = 0.137$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.8 : Robustness Checks - resources excluding timber (subsoil resources), resource abundance as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
LOG PC RENTS$_{t-1}$	-0.0035	0.0031	-0.0048	0.0010	0.0026*	0.0064***
	(-0.55)	(0.44)	(-1.16)	(0.23)	(1.78)	(3.47)
AUTOCRACY$_{t-1}$	-0.0036*	-0.0010	-0.0036**	-0.0013	-0.0003	-0.0005
	(-1.77)	(-0.42)	(-2.17)	(-0.63)	(-0.39)	(-0.78)
INTERACT$_{t-1}$		-0.0011*		-0.0007*		-0.0006***
		(-1.86)		(-1.65)		(-3.53)
LOG GDP PC$_{t-1}$	0.0499	0.0524	0.0481***	0.0495***	0.0120***	0.0074***
	(1.33)	(1.36)	(5.02)	(5.10)	(3.37)	(2.91)
LOG REGUL$_{t-1}$					0.600***	0.620***
					(20.69)	(28.51)
Observ.	830	830	830	830	746	746
Countries	146	146	146	146	132	132
r^2	0.527	0.533	0.405	0.407		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.291$	$Pr > \chi^2 = 0.364$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.9 : Robustness Checks - resources excluding timber (subsoil resources), resource dependence as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
RENTS GDP$_{t-1}$	-0.0020	0.0009	-0.0016	-0.0004	-0.0005	0.0002
	(-1.25)	(0.36)	(-1.48)	(-0.22)	(-1.55)	(0.58)
AUTOCRACY$_{t-1}$	-0.0036*	-0.0030	-0.0034**	-0.0031*	-0.0004	-0.0013***
	(-1.76)	(-1.43)	(-1.98)	(-1.68)	(-0.52)	(-2.63)
INTERACT$_{t-1}$		-0.0002		-0.00008		-0.00007**
		(-1.57)		(-0.63)		(-2.20)
LOG GDP PC$_{t-1}$	0.0484	0.0501	0.0460***	0.0468***	0.0114***	0.0132***
	(1.31)	(1.36)	(4.96)	(4.89)	(3.33)	(5.59)
LOG REGUL$_{t-1}$					0.614***	0.593***
					(22.44)	(32.14)
Observ.	830	830	830	830	746	746
Countries	146	146	146	146	132	132
r^2	0.529	0.532	0.403	0.401		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.265$	$Pr > \chi^2 = 0.508$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.10 : Robustness Checks - excluding former Soviet states, resource abundance as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
LOG PC RENTS$_{t-1}$	-0.00451	0.00674	-0.00290	0.00785	0.00313	0.0170***
	(-0.42)	(0.60)	(-0.49)	(1.14)	(1.58)	(7.15)
AUTOCRACY$_{t-1}$	-0.00390*	0.00630	-0.00392**	0.00271	-0.000216	0.00539***
	(-1.84)	(1.53)	(-2.27)	(0.80)	(-0.26)	(4.77)
INTERACT$_{t-1}$		-0.00261**		-0.00153**		-0.00178***
		(-2.58)		(-2.22)		(-6.10)
LOG GDP PC$_{t-1}$	0.0553	0.0687*	0.0470***	0.0507***	0.00929***	0.00284
	(1.43)	(1.70)	(4.94)	(5.22)	(3.12)	(1.27)
LOG REGUL$_{t-1}$					0.646***	0.662***
					(25.07)	(41.88)
Observ.	797	797	797	797	721	721
Countries	134	134	134	134	121	121
r^2	0.531	0.542	0.401	0.402		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.386$	$Pr > \chi^2 = 0.260$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.11 : Robustness Checks - excluding former Soviet states, resource dependence as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE	(5) LOG REGUL GMM	(6) LOG REGUL GMM
RENTS GDP$_{t-1}$	-0.0019	0.0020	-0.0011	0.0021	-0.0004	0.0019***
	(-1.44)	(0.83)	(-1.26)	(1.06)	(-1.24)	(5.38)
AUTOCRACY$_{t-1}$	-0.0039*	-0.0018	-0.0037**	-0.0019	-0.0013	-0.0002
	(-1.88)	(-0.80)	(-2.19)	(-0.90)	(-1.52)	(-0.57)
INTERACT$_{t-1}$		-0.0003**		-0.0002*		-0.0002***
		(-2.04)		(-1.81)		(-9.24)
LOG GDP$_{t-1}$	0.0479	0.0575	0.0445***	0.0502***	0.0083***	0.0094***
	(1.27)	(1.49)	(4.83)	(4.72)	(2.64)	(3.58)
LOG REGUL$_{t-1}$					0.637***	0.633***
					(26.26)	(37.60)
Observ.	797	797	797	797	721	721
Countries	134	134	134	134	121	121
r^2	0.532	0.540	0.400	0.397		
Instruments					73	94
AR(2)					$Pr > z = 0.000$	$Pr > z = 0.000$
Hansen test of overid.					$Pr > \chi^2 = 0.403$	$Pr > \chi^2 = 0.291$

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Period dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions. GMM refers to the system GMM estimator. Lags 2-4 are used as instruments and the *two-step*-option is applied.

Table A.12 : Robustness Checks - yearly data, resource abundance as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE
LOG PC RENTS$_{t-1}$	-0.00795	0.000309	-0.00787	0.000322
	(-1.00)	(0.04)	(-1.20)	(0.04)
AUTOCRACY$_{t-1}$	-0.00152	0.00528*	-0.00120	0.00475
	(-3.10)	(4.61)	(-2.54)	(4.29)
INTERACT$_{t-1}$		-0.00169**		-0.00143**
		(-2.30)		(-2.26)
LOG GDP PC$_{t-1}$	0.0950***	0.101***	0.0724***	0.0762***
	(2.91)	(2.98)	(4.33)	(4.42)
Observ.	4477	4477	4477	4477
Countries	145	145	145	145
r^2	0.494	0.499	0.378	0.377

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions.

Table A.13 : Robustness Checks - yearly data, resource dependence as main regressor

	(1) LOG REGUL FE	(2) LOG REGUL FE	(3) LOG REGUL RE	(4) LOG REGUL RE
RENTS GDP$_{t-1}$	-0.0007	0.0010	-0.0009	0.0008
	(-0.83)	(0.63)	(-1.18)	(0.56)
AUTOCRACY$_{t-1}$	-0.0015	-0.0003	-0.0012	-0.00005
	(-0.87)	(-0.17)	(-0.76)	(-0.03)
INTERACT$_{t-1}$		-0.0001		-0.0001
		(-1.62)		(-1.62)
LOG GDP PC$_{t-1}$	0.0900***	0.0930***	0.0675***	0.0707***
	(2.75)	(2.87)	(4.12)	(4.24)
Observ.	4477	4477	4477	4477
Countries	145	145	145	145
r^2	0.494	0.499	0.379	0.376

t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Year dummies are included in all regressions to control for overall time trends. The r^2 refers to the within r^2 in the FE regressions and the overall r^2 in the RE regressions.